**Science Lesson Planning Grid**

Name: ____ Forensics Module ____________________________________________

Unit: ____ Fingerprints _______________________________________________

Inclusive Dates (Tentative): ___________ 3 class periods (30 minutes each) __________

**Essential or Guiding Questions:** What are the fundamental big issues that students must be able to address by the end of the unit. (Why bother doing this unit?)

1. What is a fingerprint and how is one made?
2. What are the three primary types of fingerprints that exist? How are they identified?
3. What other types of fingerprints exist?
4. How do we match a fingerprint to a specific person?

**Outcomes:** Attached applicable state and local standards

**Standards:**

SIS1. Make observations, raise questions, and formulate hypotheses.
SIS2. Design and conduct scientific investigations.
SIS3. Analyze and interpret results of scientific investigations.
SIS4. Communicate and apply the results of scientific investigations.

**Content Outcomes** – What must students know to be able to answer the essential questions?

1. How fingerprints are made.
2. What types of fingerprint patterns exist and which are the three most common.
3. How to identify each of the pattern types that exist.

**Learner Outcomes:** What must students be able to do (skills) to be able to answer the essential questions?

- Follow lab procedures
- Identify the types of fingerprints that exist.
- Analyze sample fingerprints and identify the patterns that exist.
- Analyze fingerprints and determine whose fingers they match up to.
Assessment – How will students demonstrate they have mastered each of the outcomes?

Successful determination of fingerprint patterns.
Successful identification of fingerprints to suspect.

Learning Activities – What will students do to prepare for the assessments?

“Study your fingerprints.” Laboratory Activity
“Who done it?” Activity

Materials – Texts, films, audio laboratory supplies etc.

:  
Fingerprinting Vocabulary
Fingerprinting Background
Materials for “Study your fingerprints.” activity;
  • Handout
  • Clear tape
  • ruler
  • Pencil
• 3 x 5 index card
• magnifying glass
• pen.
Materials for “Who done it?” laboratory activity;
• Handout
• Pen
• Fingerprints from 8 suspects
• Fingerprints from the crime scene
• Magnifying glass
Fingerprinting Vocabulary:

**Arch**: a fingerprint pattern in which the ridge pattern originates from one side of the print and leaves from the other side

**Core**: a center of a loop or whorl

**Delta**: a triangular ridge pattern with ridges that go in different directions above and below a triangle

**Fingerprint**: an impression left on any surface that consists of patterns made by the ridges on a finger

**Latent Fingerprint**: a hidden fingerprint made visible through the use of powders or other techniques

**Loop**: a fingerprint pattern in which the ridge pattern flows inward and returns in the direction of the origin

**Plastic Print**: print that leaves an impression on objects such as soap or clay

**Ridge Pattern**: the recognizable pattern of the ridges found in the end joints of fingers that form line on the surfaces of objects in a fingerprint. They fall into three categories: arches, loops, and whorls

**Whorl**: a fingerprint pattern that resembles a bulls-eye

Fingerprinting Background

Almost every time you touch something, you leave a fingerprint. Our hands are covered with sweat pores. Sweat is often mixed with other body oils and dirt. When you touch something with your fingers, the oils and dirt on your skin stick to the surface of the object leaving an imprint of your fingertips. Prints that you can see with the naked eye are called visible prints while invisible prints are called latent prints. Most fingerprints are latent prints. A third type of print is a plastic print. It is a print that leaves an impression on objects such as soap or clay. Fingerprints are important to forensic scientists as a means of identification to help solve crimes. Fingerprints offer an infallible means of personal identification. The outer layer of skin on our fingers is made up of a series of ridges. The ridges on each person's fingers are unique. Other personal characteristics change - fingerprints do not. All individuals have their own unique ridge pattern...even identical twins. This is because prints are determined by genetics and environmental conditions.

Historically, fingerprints have been used as a means of identification for centuries. In ancient Babylon, fingerprints were used on clay tablets for business transactions and in ancient China, thumb prints have been found on clay seals.

Fingerprints were first used in the United States by the New York Prison system in 1903. The first criminal conviction based on fingerprint evidence was the case of Thomas Jennings who was charged with the murder of Charles Hiller, while committing a burglary in 1911. The F.B.I. has a collection of fingerprints that numbers in the millions. Investigators often compare fingerprints from a crime scene to the fingerprints in the F.B.I. fingerprint bank to see if they can find a match and thus know who committed the crime. They often fingerprint suspects to see if their fingerprints match those found at the crime scene.
There are three basic types of fingerprints - the arch, the whorl and the loop.

Arch patterns have lines that start at one side of the print and then rise toward the center of the print and leave on the other side of the print.

Whorl patterns have a lot of circles that do not leave either side of the print.

Loop patterns have lines that start on one side of the print and then rise toward the center of the print and leave on the same side of the print they start on.
Forensic scientists look at the presence of certain designs within the fingerprints. One of the first things scientists look for are cores and deltas. Many times these are used as types of landmarks on someone’s print. These allow ridges to be counted accurately as well as identifying other patterns that exist within prints.

Examples of other patterns that exist within fingerprints…

- Ridge ending
- Island or short ridge
- Bridge
- Eye or enclosure
- Delta

- Bifurcation or fork
- Dot
- Spur
- Double bifurcation
- Trifurcation

- a scar
- delta
- spur

- core
- island
- dot
- bridge

- bifurcation
- double bifurcation
- ridge ending
Study Your Fingerprints Activity

Objectives: By the end of this lesson you will be able to

- Identify your fingerprints
- Compare your fingerprints to those of your classmates

Materials:

- Clear adhesive tape ~3/4 wide
- Ruler
- Pencil
- 3 x 5 index card
- Magnifying glass
- Pen

Procedure:

1. On a lined 3 x 5 card, rub the end of a pencil in a back and forth motion, creating a patch of graphite about 2 by 3 inches.
2. Rub one of your fingers across the graphite patch, gently rolling from side to side so that the fingertip become coated with graphite from the first joint in the finger to the tip and from fingernail edge to fingernail edge.
3. Tear off a piece of tape (may be helpful to have a group mate do this for you) about 2 inches long. Carefully press the sticky side of the tape onto your finger from the edge of your fingernail across your finger pad to the other side of your fingernail.
4. Gently peel the tape off your finger.
5. Press the tape, sticky side down, into the box provided on the next page.
6. Examine your fingerprint using a magnifying glass.
7. Compare your fingerprint to the samples to the pictured samples.
8. Identify whether your fingerprint pattern is a loop, arch, or whorl.
Tape your fingerprint into the space provided and identify its pattern type.

Which hand? __________________________

Which finger? __________________________

Fingerprint pattern? _____________________

Data collection from the class:

Complete the table: count the number of students showing each of the three types of fingerprint patterns and place those numbers in the Data Table.

<table>
<thead>
<tr>
<th></th>
<th>Loop</th>
<th>Whorl</th>
<th>Arch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of students</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>showing this trait</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total size of class</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage of class</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>showing this trait</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Divide the number of</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>students with the trait</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>by the total students in</td>
<td></td>
<td></td>
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<tr>
<td>the class and then</td>
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<tr>
<td>multiply by 100%)</td>
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<td></td>
</tr>
<tr>
<td>Experts say this</td>
<td>65%</td>
<td>30%</td>
<td>5%</td>
</tr>
<tr>
<td>percentage should be:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Questions:

1. Did the class percentage agree with the value given by experts (yes or no)? Explain your answer using data for support.
2. Describe how to improve this data collecting activity so that your results might be more reliable.
3. Look at some other fingerprint patterns and try to identify any that you may have: list them here and circle them on your fingerprint in pen.
Who Done It? Activity

Objectives: By the end of this activity you will be able to:

- Match the latent crime scene print to one of the suspect’s fingerprints
- Justify your match by identifying the fingerprint pattern along with as many fingerprint patterns found in both the crime scene print and the suspect’s fingerprint.

Materials:

- Pen
- Fingerprints from 8 suspects
- Fingerprints from the scene of the crime
- Magnifying glass

MEMO: From the desk of Captain Bob Blue

CSI Team-
This email just came across my desk; consider yourselves assigned to the case. I want your best work; my brother coach Blue and the basketball team are counting on you!

To: CSI Attleboro
From: CoachBlue@attleboroschools.com
Subject: We need your help!
Saturday 3/5/2010 6:41 am

Good Morning all you lovely geniuses at CSI,
We’ve had a break-in at the high school and we need your help. When I came to get ready for practice this morning the boys’ locker room door was hanging open and a section of the frame was splintered. The scene I found when I went inside was enough to scare the sneakers off any coach. Buddy, our trusty eagle mascot costume had been stabbed! The body section was unharmed but the mask had 9 stab wounds. I turned the corner and found that the Basketball team’s lockers were hanging open, with most of the contents jumbled on the floor. The team tells me that they are missing 5 iPods, one expensive watch, two pairs of limited edition Nikes, one pair of vintage Air Jordans, and a pair of diamond earrings that Joey was hiding for his mother’s birthday next week. I noticed that the doors of most of the lockers were bent and had scratches in the paint on the sides and corners. Officer Hale tells me that we are very lucky because the locker room had just been cleaned and sanitized due to Thursday’s outbreak of blue heffalump flu on the lacrosse team. The custodian did such a thorough job that the fingerprints of everyone who used the locker room before the break in were wiped away.

Officer Hale only found three sets of fingerprints, and one of the sets is probably mine from this morning. Footage from the security cameras shows a masked figure in black clothing, of indeterminate age and height, rattling the door to the locker room. The tape goes suspiciously blank at this point. The police have found eight
suspects with an alibi that ‘don’t hold water’, as grandpa Blue used to say, well, except for Joey’s solitary fishing expedition. Here are the eight suspects and their alibis; I need you to tell me which suspect was the thief.

1. Joey Jeanette Jameson – 5’11’ – on the basketball team, claims he was fishing the Ten Mile river after dinner, then went right back to fishing the next morning. Diamond earrings for his momma’s birthday were taken from his locker.

2. Ivanna Tinkle – 5’3” – Joey’s girlfriend claims she was washing her hair home alone. Her friends report that she was jealous because Joey got his mother better earrings than he gave Ivanna.

3. Jake “the jock” Johnston – 6’6’’ - Reported to be seen in the hallway near the locker room the evening before the crime, he claims he was home alone watching bowling during the incident.

4. Lou Lou L’Amour – 5’3”- The custodian reports she showed up at the locker room with a plate of cookies around 8p.m. last night and seemed disappointed that the team had gone home. She claims she was home baking during the crime.

5. Dan “the man” Generalee – 5’10” - The responding officers found him camped out in the woods bordering the school. He claims he was working on his survival skills but a tent and generator were found near his location.

6. Peg “the leg” Pullanski - 5’0”- The new librarian, was seen by custodial staff decorating the library shelves with four-leaf clovers the night before the crime. She claims to have been home combing her lucky rabbit’s feet collection at the time of the break in.

7. Randy Bowles – 6’6” – The custodian reports that he ran into the locker room thinking it was a bathroom, looked around and ran out again at about 8:30 p.m. Randy claims to have been home enjoying digestive biscuits and tea during the break in.

8. Ramsey R. Ramsbottom – 6”2’ – The star player of our rival basketball game. He was suspended for tackling our mascot after loosing the last game. He claims to have been at a basketball court practicing all morning, but there are no witnesses to verify this.

Good Luck Team! I hope you can find the thief and mascot murderer.

Coach Blue

Procedure:

Identify the suspect whom the fingerprint matches by identifying as many similarities between it and the print found at the crime scene.

Questions:

1. Which suspect is responsible for the crime? Explain using the data you collected.
2. What is their primary pattern (arch, loop, or whorl)?
3. What other similarities allowed you to match up the suspect to the scene of the crime?