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| **TEXAS CTE LESSON PLAN**[www.txcte.org](http://www.txcte.org) |
| **Lesson Identification and TEKS Addressed** |
| **Career Cluster** | Law, Public Safety, Corrections & Security |
| **Course Name** | Forensic Science |
| **Lesson/Unit Title** | Development of Latent Prints |
| **TEKS Student Expectations** | **130.339. (c)** **Knowledge and Skills**(2) The student, for at least 40 of instructional time, conducts laboratory and/or field investigations using safe, environmentally appropriate, and ethical practices. (A) The student is expected to demonstrate safe practices during laboratory and field investigations and(B) The student is expected to demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials. (8) The student analyzes impression evidence in forensic science. (C) The student is expected to distinguish among patent, plastic, and latent impressions(D) The student is expected to perform laboratory procedures for lifting latent prints on porous and nonporous objects using chemicals such as iodine, ninhydrin, silver nitrate, and cyanoacrylate resin(E) The student is expected to perform laboratory procedures for lifting latent prints on nonporous objects using fingerprint powders such as black powder and florescent powders |
| **Basic Direct Teach Lesson**(Includes Special Education Modifications/Accommodations and one English Language Proficiency Standards (ELPS) Strategy) |
| **Instructional Objectives** | The student will be able to:* Identify the factors affecting fingerprints.
* Select appropriate techniques for the development of latent prints on various surfaces.
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| **Rationale** | Forensic Fingerprint Examiners are often expected to develop latent fingerprints on items of evidence before comparisons of fingerprints can be made. |
| **Duration of Lesson** | 1 ½ hours lecture, 1+ hour lab |
| **Word Wall/Key Vocabulary***(ELPS c1a,c,f; c2b; c3a,b,d; c4c; c5b) PDAS II(5)* |  |
| **Materials/Specialized Equipment Needed** | **Materials*** Development of Latent Prints Lab
* Development of Latent Prints Packet
* Black fingerprint powder
* Soft-bristle fingerprinting brush
* Transparent tape
* Superglue
* Glass microscope slides
* Empty soda cans
* Compact discs
* Empty glass bottles
* Latex or Nitrile gloves
* Small paper cup
* Fuming chamber
* 0.6% Ninhydrin solution
* Black felt tip markers
* Development of Latent Prints Lab Quiz and Key
* Development of Latent Prints Lab Checklist
* Discussion Rubric
* Individual Work Rubric
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| **Anticipatory Set**(May include pre-assessment for prior knowledge) | Gently rub your nose with your fingers then plant your fingerprints on a white plastic surface such as the cover of a white binder. Show the students that the fingerprints are not visible. Apply a small amount of black fingerprint powder to a fingerprinting brush and gently swirl the brush over the area to bring up the fingerprints. Explain the difference between latent and plastic fingerprints. |
| **Direct Instruction \*** | 1. Types of Fingerprint Impressions
	1. Patent fingerprints – visible prints left on a smooth surface when blood, ink, or some other liquid meets the hands and is then transferred to the surface
	2. Plastic fingerprints – actual indentations left in some soft materials such as clay, putty, wax, or dust
	3. Latent fingerprints – hidden prints caused by the transfer of oils and other bodily secretions onto a surface. They can be made visible by different methods (dusting with powders, chemical reactions, etc.).
2. Fingerprint Powders are applied lightly to a nonabsorbent surface with a soft brush. They readily adhere to sweat residues and/or deposits of body oils left on the surface.
	1. Gray and black powders are the most common, and are chosen to create the best contrast with the surface.
	2. Magnetic powder is applied with a special brush on leather and rough plastic surfaces.
	3. Fluorescent powders are used to photograph latent prints on multi-colored surfaces. They fluoresce under ultraviolet light.
3. Fingerprint Chemicals
	1. Ninhydrin reacts with amino acids in sweat to form purple-blue prints. A 0.6% solution (in ethanol) is sprayed onto porous surfaces such as paper.
4. Physical Developer is a silver nitrate-based liquid reagent used on porous surfaces. It is often used as the last resort because it destroys protein.
5. Cyanoacrylate (superglue) fuming was developed in 1982 by Japanese Police. It is used on a variety of materials, not only to visualize latent prints, but also to semi-permanently affix them to the surface.
6. DFO (1,8-diazafluotrn-9-one) is a newer replacement chemical for ninhydrin. It is 2.5 times more sensitive than ninhydrin.
7. Rhodamine 6G is a fluorescent dye that may be used after cyanoacrylate fuming to visualize latent prints under laser light.
8. Iodine fuming is one of the oldest latent print development methods. Solid iodine crystals sublimate, and the vapor will react with fatty oils and some sweat residue. Iodine prints are not permanent and will begin to fade once the fuming process is stopped.
9. Gentian violet (or crystal violet) is used for developing latent prints on the adhesive side of tape. An aqueous solution of crystal violet is sprayed directly onto the adhesive.
10. Amido Black is a protein dye stain that can develop faint bloody fingerprints on porous and nonporous surfaces.
11. LCV (Leuco Crystal Violet) is a protein stain spray that can develop faint or invisible bloody fingerprints on non-porous surfaces

IV. Preservation of developed latent prints* 1. Photograph
	2. Covering the prints to preserve it in its entirety (if on a small object)
	3. Lifting the prints with adhesive tape and placing the tape with prints on a card with labels

V. Composition of fingerprints* 1. Sweat
		1. 99.0-99.5 % water
		2. 0.5-1.0% solids
			1. 50% organic solids (mostly amino acids)
			2. 50% inorganic solids (NaCl and KCl)
	2. Contaminants
		1. Bodily fluids (blood, saliva, nasal secretions, semen, etc.)
		2. Oils and fats (sebum)

VI. Factors affecting fingerprints1. Age – thinner epidermis, flattening of dermal papillae, creases, etc.
2. Fine ridge structure – less skin contact leads to a spotty appearance.
3. Stimuli – sweating can be due to warmth, exertion, fever, drugs, anxiety, tension, pain, or spicy foods.
4. Occupational and medical condition – teaching, and other positions in which a person handles or shuffles papers, can cause fine ridge structure.
5. Transposal factors
	1. Receiving surface texture
	2. Contaminants on the hands
	3. Contaminants on the receiving surface
	4. The manner of contact
	5. The amount of pressure
6. Environmental factors
	1. Temperature
	2. Humidity
	3. Handling

*Individualized Education Plan (IEP) for all special education students must be followed. Examples of accommodations may include, but are not limited to:*none |
| **Guided Practice \*** | Review and discuss the information and the steps described in“Processing Guide for Developing Latent Prints” on the FBI website: http://www.fbi.gov/about-us/lab/forensic-science-communications/fsc/jan2001/lpu.pdf. Use the Discussion Rubric for assessment.Play and discuss a video about fingerprint analysis. To find a video do an Internet search for the following: Forensics you decide a man scorned. Use the Discussion Rubric for assessment.*Individualized Education Plan (IEP) for all special education students must be followed. Examples of accommodations may include, but are not limited to:*none |
| **Independent Practice/Laboratory Experience/Differentiated Activities \*** | Complete the Development of Latent Prints Lab. Follow all safety procedures and protocols. Use the Development of Latent Prints Lab packet and checklist. |
| **Lesson Closure** |  |
| **Summative/End of Lesson Assessment \***  | *Individualized Education Plan (IEP) for all special education students must be followed. Examples of accommodations may include, but are not limited to:*none |
| **References/Resources/****Teacher Preparation** | Saferstein, Richard. Forensic Science: An Introduction. New Jersey:Pearson Prentice Hall, 2008.Bertino, Anthony J. Forensic Science: Fundamentals and Investigations.Mason, OH: South-Western Cengage Learning, 2009.Fisher, Barry A.J. Techniques of Crime Scene Investigation. 7th ed. Boca Raton, FL: CRC Press, 2004.Federal Bureau of Investigations <http://www.fbi.gov/about-us/lab/forensic-science-communications/fsc/jan2001/lpu.pdf>Do an Internet search for the following: * Forensics you decide a man scorned
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| **Additional Required Components** |
| **English Language Proficiency Standards (ELPS) Strategies** |  |
| **College and Career Readiness Connection[[1]](#footnote-1)** | **Science Standards**I. Nature of Science: Scientific Ways of Learning and Thinking C. Collaborative and safe working practices1. Collaborate on joint projects.
2. Understand and apply safe procedures in the laboratory and field, including chemical, electrical, and fire safety and safe handling of live or preserved organisms.
3. Demonstrate skill in the safe use of a wide variety of apparatuses, equipment, techniques, and procedures.
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| **Recommended Strategies** |
| **Reading Strategies** |  |
| **Quotes** |  |
| **Multimedia/Visual Strategy****Presentation Slides + One Additional Technology Connection** |  |
| **Graphic Organizers/Handout** |  |
| **Writing Strategies****Journal Entries + 1 Additional Writing Strategy** |  |
| **Communication****90 Second Speech Topics** |  |
| **Other Essential Lesson Components** |
| **Enrichment Activity**(e.g., homework assignment) | For reinforcement, students will make a chart of fingerprint composition and suitable development methods. Use the Individual Work Rubric for assessment.For enrichment, students will identify numerous points of identification present on each fingerprint on the developed latent prints, and compare them to the known standards. Use the Individual Work Rubric for assessment. |
| **Family/Community Connection** |  |
| **CTSO connection(s)** | SkillsUSA |
| **Service Learning Projects** |  |
| **Lesson Notes** |  |

1. Visit the Texas College and Career Readiness Standards at <http://www.thecb.state.tx.us/collegereadiness/CRS.pdf>, Texas Higher Education Coordinating Board (THECB), 2009. [↑](#footnote-ref-1)