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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, and Security |
| **Course Name** | Forensic Science |
| **Lesson/Unit Title** | Footwear Impressions |
| **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.  (3) The student uses scientific methods and equipment during laboratory and field investigations.  (F) The student is expected to collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as calculators, spreadsheet software, data-collecting probes, computers, standard laboratory glassware, microscopes, various prepared slides, stereoscopes, metric rulers, electronic balances, gel electrophoresis apparatuses, micropipettors, hand lenses, Celsius thermometers, hot plates, lab notebooks or journals, timing devices, cameras, Petri dishes, lab incubators, dissection equipment, meter sticks, and models, diagrams, or samples of biological specimens or structures  (G) The student uses scientific methods and equipment during laboratory and field investigations. The student is expected to analyze, evaluate, make inferences, and predict trends from data and  (H) The student uses scientific methods and equipment during laboratory and field investigations. The student is expected to communicate valid conclusions supported by the data through methods such as investigative reports, lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports.  (4) The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom.  (A) The student is expected to analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, to encourage critical thinking  (D) The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. The student is expected to evaluate the impact of scientific research on criminal investigation, society, and the environment  (E) The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. The student is expected to evaluate models according to their limitations in representing biological objects or events and  (F) The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. The student is expected to research and describe the history of science and contributions of scientists within the criminal justice system  (6) The student recognizes the procedures of evidence collection while maintaining the integrity of a crime scene.  (D) The student is expected to apply knowledge of the elements of criminal law that guide search and seizure of persons, property, and evidence  (H) The student recognizes the procedures of evidence collection while maintaining the integrity of a crime scene. The student is expected to demonstrate proper techniques for collecting, packaging, and preserving physical evidence found at a crime scene. |
| **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:   * Distinguish between several types of impression evidence * Differentiate between class and individual characteristics * Collect and preserve footwear impressions left on soil by plaster casting |
| **Rationale** | Impression evidence found at the crime scene often provides important investigative leads. In addition to defining class characteristics, it can also provide unique, individual characteristics that may lead to a specific source. |
| **Duration of Lesson** | * 75-minute lecture * 45-minute lab * 30-minute cleaning of the cast * 45-minute comparison and identification. |
| **Word Wall/Key Vocabulary**  *(ELPS c1a,c,f; c2b; c3a,b,d; c4c; c5b) PDAS II(5)* | **Patent impression** – visible, two-dimensional (ex. bloody shoeprints)  **Latent impression** – hidden, visualized by chemical or physical  development  **Plastic impression** – three-dimensional imprints (ex. left in snow, soil, etc.)  **Class characteristics** – characteristics that are common among comparable articles of footwear (size, tread patter, brand, etc.)  **Individual characteristics** – unique characteristics observed only on an individual piece of footwear (ex. an unusual wear pattern, a pebble stuck in a part of the tread pattern, damages such as cuts, tears, and  abrasions) |
| **Materials/Specialized Equipment Needed** | **Materials:**   * Footwear Impressions Lab Packet * The Forensic Analysis of Footwear Impression Evidence (pp. 121-131) <http://www.fbi.gov/about-us/lab/handbook-of-forensic-services-pdf/> * Discussion Rubric * Footwear Impressions Lab Rubric * Individual Work Rubric * Writing Rubric   **Equipment:**   * Forensics lab equipment |
| **Anticipatory Set**  (May include pre-assessment for prior knowledge) | Use the following article for a class discussion, found at  <https://www.crimemuseum.org/crime-library/forensic-investigation/footprints/>  Use the Discussion Rubric for assessment. |
| **Direct Instruction \*** | 1. Types of impressions    1. Patent impression – visible, two-dimensional (ex. Bloody shoeprints)    2. Latent impression – hidden, visualized by chemical or physical development    3. Plastic impression – three-dimensional imprints (ex. left in snow, 2. soil, etc.) 3. Class characteristics – characteristics that are common among similar articles of footwear (size, tread patter, brand, etc.) 4. Individual characteristics – unique characteristics observed only on an individual piece of footwear (ex. an unusual wear pattern, a pebble stuck in a part of the tread pattern, damages such as cuts, tears, and abrasions) 5. Typical clues determined from show impressions    1. Size of the footwear    2. Brand of the footwear    3. Sex of the wearer    4. Weight of the wearer (based on the depth of the impression)    5. The type of footwear (high heels, work boots, etc.) 6. Impression databases    1. TreadMarkTM    2. SoleMateTM    3. TreadMateTM 7. Factors affecting shoe wear patterns 8. Walking habits (walking on toes or heels, feet straight or toes pointed in/out) 9. Body weight 10. Shape of the feet 11. Activities often engaged in 12. Surface walked on 13. Unique debris, holes, cuts 14. Collection & preservation of impression evidence 15. Photograph that includes a ruler 16. Lifting with electrostatic dusting or gel lifting 17. Casting with plaster of Paris (CaSO4) or dental stone (on snow)   *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 \*** | *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 Footwear Impressions Lab (see materials below). * Footwear Impressions Comparison – Give each student another student’s shoe cast, made during the impressions lab. Give the students four (4) possible shoes with which to compare and identify the source of the unknown impression. Have the students give an oral or written detailed description of their basis for identification, including class characteristics and locations (size, dimensions, brand, model, tread patterns, and design), and individual characteristics and locations (materials stuck in the tread pattern, cut, tear, holes, etc.). Use the Writing 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 |
| **Lesson Closure** |  |
| **Summative/End of Lesson Assessment \*** | Students will conduct lab work using the Footwear Impressions Lab Packet. |
| **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. * Federal Bureau of Investigation <https://www.fbi.gov/file-repository/handbook-of-forensic-services-pdf.pdf> |
| **Additional Required Components** | |
| **English Language Proficiency Standards (ELPS) Strategies** |  |
| **College and Career Readiness Connection[[1]](#footnote-1)** | Science Standards   1. Nature of Science: Scientific Ways of Learning and Thinking    1. Cognitive skills in science       1. Use creativity and insight to recognize and describe patterns in natural phenomena.       2. Rely on reproducible observations of empirical evidence when constructing, analyzing, and evaluating explanations of natural events and processes. |
| **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 enrichment, the student will collect and preserve impression evidence using a dental stone.  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)