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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** | Safety & Scientific Method: Scientific Reasoning |
| **TEKS Student Expectations** | **130.332. (c) Knowledge and Skills**  (4) The student formulates ideas, proposals, and solutions to address problems related to the career field in order to ensure effective and efficient delivery of services.  (A) The student is expected to use analytical skills to formulate ideas, proposals, and solutions to problems  (B) The student is expected to formulate ideas, proposals, and solutions to ensure delivery of services and  (C) The student is expected to use critical-thinking skills to solve ethical issues identified in the career field. |
| **Basic Direct Teach Lesson**  (Includes Special Education Modifications/Accommodations and  one English Language Proficiency Standards (ELPS) Strategy) | |
| **Instructional Objectives** | 1. Analyze, evaluate, and critique scientific explanations by using data, logical reasoning, and observations.  2. Communicate and apply scientific information from current events and published articles.  3. Draw inferences based on data related to products and services. |
| **Rationale** | Scientific reasoning is a skill necessary to forensic science. Forensic scientists need to be able to use scientific reasoning in order to process a crime scene and the evidence found there. |
| **Duration of Lesson** | 2-3 hours |
| **Word Wall/Key Vocabulary**  *(ELPS c1a,c,f; c2b; c3a,b,d; c4c; c5b) PDAS II(5)* |  |
| **Materials/Specialized Equipment Needed** | * Computer with Internet access * Accuracy and Precision in the Food Industry Lab Handout * Bags of chips * Scales * Marking pen   **Materials**   * Last Picnic Handout and Key * Scientific Method and Reasoning Worksheet and Key * Accuracy and Precision Lab * Scientific Reasoning Quiz and Key * Discussion Rubric * Individual Work Rubric * Group Evaluation * Writing Rubric |
| **Anticipatory Set**  (May include pre-assessment for prior knowledge) | Prior Student Learning  – Lab Safety  – Understanding the Scientific Method |
| **Direct Instruction \*** | I. Scientific Reasoning  A. The Cycle of Science  1. Scientific reasoning must use both inductive and deductive reasoning  a) Inductive reasoning – moving from specific observations to broader generalizations and theories  (1) Begin with specific observations and measurements, and then detect patterns and regularities  (2) Formulate some tentative hypotheses that we can explore  (3) Finally, develop some general conclusions or theories  b) Deductive reasoning – works from the general to the specific  (1) Begin with creating a theory about a topic of interest  (2) Narrow that down into a more specific hypothesis that we can test  (3) Narrow that down even further when we collect observations to address the hypothesis  (4) Test the hypothesis with specific data  B. How Scientists Reason  1. Scientists use analogies to form theories, generate hypotheses, and comprehend patterns of data  2. Scientists use the scientific method to generate these and create experiments to test their hypotheses  C. Experimental Control  1. Scientists work to create experimental control  2. It is important for comparison so scientists know what has the effect in an experiment  3. The control is the normal condition(s) for the subject being tested  D. Variable  1. The variable is the thing that is being changed in the experiment  2. You should only have one variable  E. Observation  1. Observations are recorded facts about what you see  2. There are two types of observations  a) Quantitative – results in a numerical form, with a unit  b) Qualitative – results in a descriptive form  F. Conclusions  1. Scientists make conclusions based on the data collected and the observations made  2. Sometimes the conclusions prove the hypothesis and sometimes they disprove the hypothesis  *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 \*** | Activities  1. Lie Detector Article. Ask the question, “Are lie detectors reliable?” Students will say yes or no. Have the students read an article about the newest research in lie detection. (To find an article do an Internet search for the following: Will Brain-Scanning Lie Detectors Free the Innocent or Jail Them.) After the students have finished the reading, discuss the information they learned from the article. Use the Discussion Rubric for assessment.  2. Accuracy and Precision in the Food Industry. Have students analyze various brands and types of lunch-sized bags of chips for accuracy and precision of their printed weight on the bags. Then have students make inferences based on their data (Note: Groups of 4–5 work best for this lab). All of the students in a group need to bring the same brand, type, and size of chip bag to class that day. Answers will vary based on the brand and the type of chips. Assess the groups’ work for accuracy. Use the Individual Work Rubric and the Group Evaluation for assessment as needed.  3. The Last Picnic. Students will use deductive reasoning to identify the murderer in this activity. Use the Last Picnic handout for the activity. Use the Last Picnic Key and 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 |
| **Independent Practice/Laboratory Experience/Differentiated Activities \*** | *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 \*** | Scientific Reasoning Quiz and Key  Last Picnic Key  Scientific Method and Reasoning Worksheet Key  Discussion Rubric  Individual Work Rubric  Group Evaluation  Writing Rubric  *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** | Resources  Davis, Raymond. Modern Chemistry. Holt McDougal; 1st Edition, 2002  Francisco Redi Experiment <http://www.scientus.org/Redi-Galileo.html>  Do an Internet search for the following:  • Will Brain-Scanning Lie Detectors Free the Innocent or Jail Them  • Burgled Bonuses |
| **Additional Required Components** | |
| **English Language Proficiency Standards (ELPS) Strategies** |  |
| **College and Career Readiness Connection[[1]](#footnote-1)** |  |
| **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) |  |
| **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)