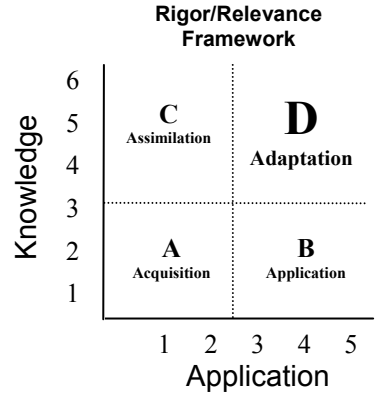
CRIME LAB INC.

Gold Seal Lesson



Career Cluster - Law and Public Safety

Curriculum Area

TRADE & INDUSTRIAL/POLICE SCIENCE **Grades 9-12**

Instructional Focus

Physical Science: Understand basic concepts about the structure and properties of matter.
Science as Inquiry: Apply methods of inquiry needed to conduct research, draw conclusions, communicate and apply findings.
Police Science: Apply the fundamentals of criminal investigation, search and recording of the crime scene, and principles involved in collection and preservation of physical evidence.
Police Science: Understand the use and function of scientific aids in crime detection.

Performance Task

The following chemistry task may be done either as a thought experiment with a paper write-up or as an actual laboratory experiment. You may wish to have students work in pairs. Remember to give students the scoring guide at the beginning to help them make their work be the best possible.

Instructions to students:
Recently, a wealthy, but possibly corrupt, government official was murdered. A vial containing 30 ml of an unknown liquid was found in the victim's apartment. The police investigators have narrowed the suspects to 15 people. Some possibly similar liquids were found in a few of the suspects' homes.

As a lab chemist for Crime Lab Inc., you have been given one sample. In order to protect the innocent, you do not know whether the sample you have is from the victim or from one of the 15 suspects. Your job is to design a test procedure to identify the ingredients in this sample, test the sample, and write a deposition or report of findings for the court.

The police lab has done preliminary "field testing" and has identified seven compounds that may be in your sample: salt, sugar, carbon powder, iron, sulfur, water, and alcohol. Your sample, to be used as evidence, will contain three or four of these compounds.

Crime Lab Inc. has limited resources and, therefore, you can perform only a limited number of tests. Your boss wants you to submit an analysis plan in advance for approval. She will be looking at how effectively you use the limited resources. You need to develop a plan that will get the job done as economically as possible.

Performance Task continued

Your plan should describe the logic you used in designing your tests, an estimate of time needed to perform each test, and an assignment list of who will perform each test. The lab has the ability to perform the following tests:

1. pH
2. Solubility
3. Magnetic effect
4. Flammability of liquids
5. Flammability of solids
6. Separation by evaporation
7. Electrolytes

After your boss approves your plan, you will have one lab day allotted to this project. You must safely conduct all the tests necessary within that time or run the risk of being fired. Crime Lab Inc. will not get paid until you submit a report stating your findings, along with how you arrived at these findings. You must also justify your findings. You should, if necessary, include recommendations for further testing.

Scoring Guide

4 Points
The student independently completes all parts of the task. His/her design includes (1) a plan that will identify all compounds in the sample, (2) appropriate selection of tests, and (3) good organization and plan of data collection. The student carries out the necessary tests, following appropriate lab safety rules and uses appropriate lab techniques. Unnecessary tests are not performed. The student correctly identifies the unknowns in his/her solution and makes appropriate conclusions. Justification of conclusions shows an analytical approach to the problem.

3 Points
The student needs some coaching to complete all parts of the task. He/she has difficulty developing an appropriate design for the analysis of his/her sample. The student has a tendency not to be as safe as he/she should be. The student needs coaching to develop the appropriate techniques. Data does not fall within an expected range for accuracy. The student needs help in identifying the unknowns. Justification of conclusions shows some lack of an analytical approach to the problem.

2 Points
Even with coaching, the student is unable to successfully complete the task. His/her design for the analysis of the sample is flawed, resulting in some errors in identifying the compounds in the solution. He/she shows a considerable lack of understanding of how certain compounds are identified. Data collection and organization are unsatisfactory. The student is unable to justify his/her conclusions.

1 Point
The student attempts but does not complete the task. He/she designs some useable elements, but is unable to develop an experimental design to perform all the tests. As a result, the student is unable to identify the compounds in his/her sample. He/she shows little understanding of how compounds are identified. The student doesn't understand what it means to justify a conclusion.

Essential Skills

- Know and apply the principles of scientific inquiry. *(s114)*
- Exhibit good data management skills by collecting, organizing, and graphing data. (s19)
- Understand physical/chemical change (e.g., change of phase between gases, liquids, and solids). (s57)
- Identify the factors affecting the deposition of particles (e.g., size, shape, density, and velocity) and analyze the sorting of sediments in a system. (s89)
- Understand the nature and purpose of a variety of technical formats such as business letters, memos, instructions, policy statements, technical proposals, user manuals, lab reports, etc. (e30)

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