

Forensic Detectives: Chemistry at Work

Grade Level: 6-8

Subject: Physical Science

Duration: Four class periods

Objectives

Students will

- discuss the definition of chemistry and the different careers related to chemistry;
- talk about how people use chemistry every day; and
- research one chemistry-related career for a class presentation.

Materials

- Computer with Internet access
- Poster board, markers, colored pencils, and other materials for student posters
- Paper and pencil

Procedures

1. After watching the program *Forensic Detectives: Chemistry at Work*, ask students how they would define chemistry. Help them create a simple definition, such as these: Chemistry is the structure and properties of substances and how they react to one another. Chemistry is about what substances are made of and how they combine.
2. Next, ask students to describe careers that involve chemistry based on what they viewed. Ask students what these careers have in common. (They all deal with substances, their properties, and how they react with each other.)
 - Chemists who study the properties and reactive qualities of elements,
 - Forensic scientists who use chemical analysis to identify or match evidence from a crime scene
 - Pyrotechnicians who combine chemicals that produce fireworks displays
 - Scientists and engineers who develop new materials
3. Tell students that chemistry is involved in many careers because chemicals are the basis for many of the products we use every day, from drugs to synthetic fibers to perfume. Almost all new products, from NASA spaceflight materials to new bubble-gum flavors, depend on chemistry. Examples follow:
 - Chemical engineers use or make new chemicals to solve problems and find practical applications.
 - Materials scientists use chemicals to discover and create new materials with unusual properties, such as a strong lightweight metal or a plastic that can conduct electricity.
 - Pharmacists, doctors, and nurses use chemistry to understand how drugs interact with the human body.
 - Food scientists are involved in making new ingredients or use chemistry to test food for quality and safety.
 - Safety and health inspectors analyze the safety of different places, from restaurants to water treatment plants.
4. Share the following list of chemistry-related careers with the class:

- Chemist
- Chemical engineer
- Materials scientist
- Agricultural chemist
- Chemical salesperson
- Chemistry teacher or college professor
- Environmental chemist
- Food and flavor chemist
- Forensic chemist
- Geochemist (study chemicals in rocks)
- Hazardous materials expert
- Medicinal chemist
- Pulp and paper chemist
- Safety or health inspector
- Textile chemist
- Water chemist

5. Have students research a chemistry-related job. They may choose one listed above or another from their own research. Have them answer the following questions:

General Questions

- Briefly describe the purpose of this job.
- What are some specific tasks?
- What kind of education and experience is required?
- Describe the kinds of places that people with this job might work. (For example, in a lab, outside, or in an office?)
- In what types of companies do people with this job work?

Personal Questions

- What would you like about this job? What wouldn't you like?
- What would be most challenging thing?
- Do you think this job is a good fit for you? Why or why not?

6. Share the following Web sites with the class. Give students at least one full class period to read about careers and select one to explore.

Chemical Careers (list of careers, background, quotes, general information)

<http://www.chemistry.org/portal/a/c/s/1/acdisplay.html?DOC=vc2%5c3wk%5cwk3.html>

A Day in the Life: Chemist

<http://www.princetonreview.com/cte/profiles/dayInLife.asp?careerID=34>

A Day in the Life: Chemical Engineer

<http://www.princetonreview.com/cte/profiles/dayInLife.asp?careerID=33>

What do Chemical Engineers Do? (click "Job Descriptions")

<http://www.aiche.org/careers/overview.htm>

Chemists and Materials Sciences

<http://www.bls.gov/oco/ocos049.htm>

Chemical Engineers

<http://www.bls.gov/oco/ocos029.htm>

Chemical and Engineering News: Career & Employment News (from flavor and fragrance chemists to those who discover and develop drugs)

<http://pubs.acs.org/cen/html/career.html>

Adventures of Meg A. Mole, Future Scientist (Featured chemists make household products and NASA insulation)

http://www.chemistry.org/portal/a/c/s/1/acdisplay.html?DOC=kids%5cmeg_index.html

Science & Technology: Cool Tech Jobs (See Cosmetic Chemist and Forensic Scientist)

<http://www.girlpower.gov/girlarea/sciencetech/jobs/index.htm>

Science Knows No Boundaries (see Chemist and Food Scientist)

<http://www.ars.usda.gov/is/kids/scientists/scientistsframe2.htm>

Going Places with Chemistry (biographies of female scientists)

http://www.chemheritage.org/women_chemistry/career/career.html

BLS Career Information: Jobs for People Who like Science (Chemist, Pharmacist)

http://stats.bls.gov/k12/html/edu_sci.htm

GetTech Careers

http://www.gettech.org/txt/category2_txt.asp?cat=5

Cool Tech Jobs: Cosmetic Chemist

<http://www.girlpower.gov/girlarea/sciencetech/jobs/cosmeticchemist.htm>

Career Zone: Chemists (click "Similar Jobs" for more)

<http://www.nycareerzone.org/graphic/profile.jsp;jsessionid=819311053448876046?onetsoc=19-2031.00>

7. Give students a full class period to complete their research. As homework, have them create a poster entitled "If I were a...." about the profession they chose. The poster should include answers to the general questions above.
8. Over the next few days, have students present their posters to the class. In their presentations, they should share answers to the personal questions above. After the presentations, ask students to discuss the jobs, particularly something that most surprised them about these careers?

Evaluation

Use the following three-point rubric to evaluate students' work during this lesson.

- **Three points:** Students recalled several chemistry-related careers from the program; created a thorough poster that answered all research questions; made a clear presentation with thoughtful answers to the personal questions.
- **Two points:** Students recalled one or two chemistry-related careers from the program; created a satisfactory poster that answered most research questions; made an adequate presentation with thoughtful answers to at least one personal question.
- **One point:** Students recalled no chemistry-related careers from the program; created an incomplete or sloppy poster that answered few or no research questions; made an unclear without answering any personal questions.

Vocabulary

chemistry

Definition: the science of the composition, structure, properties, and reactions of matter, especially of atomic and molecular systems

Context: Detectives often use chemistry in their work, such as when they analyze residue from guns and determine the blood types at crime scenes.

engineer

Definition: one who applies science to the design and development of buildings, machines, and other products

Context: Chemical engineers use chemistry to solve problems and create new products.

forensic science

Definition: the study of evidence discovered at a crime scene and used in a court of law

Context: Forensic science encompasses fingerprint and handwriting analysis, as well as close scrutiny of fibers, hair, and other evidence found at the scene of a crime.

materials science

Definition: the study of the characteristics and uses of the various materials, such as metals, ceramics, and plastics that are employed in science and technology

Context: Those who work in materials science work to develop new materials with unusual properties, such as a plastic that can conduct electricity.

Academic Standards

The National Academy of Sciences provides guidelines for teaching science and a coherent vision of what it means to be scientifically literate for students in grades K–12. To view the standards, visit this Web site:

<http://books.nap.edu/html/nses/html/overview.html#content>.

This lesson plan addresses the following national standards:

- Science as Inquiry: Understandings about scientific inquiry
- Physical Science: Properties and changes of properties in matter
- Science in Personal and Social Perspectives: Science and technology in society
- History and Nature of Science: Science as a human endeavor

Credit

Joy Brewster, curriculum writer, editor, and consultant