

A Crime Against Plants

A Botanical Crime Scene Investigation:
Exploring how we can know events of the past
By Michael Kimmel, ENSI '91

Topics:

Nature of Science
Basic Processes

Synopsis:

Crime scene investigations serve as excellent examples of how science can explain past events by careful observation and analysis of present evidence. This lesson provides a novel opportunity for students to examine the evidence of a puzzling phenomenon involving a small tree, and with a little research, arrive at a reasonable explanation of what happened. Helps to fulfill the National Science Standards for the History and Nature of Science and specific content goals in the Life Science and Earth/Space Science standards

Principle Concept:

Evidence in the present can reveal events of the past (historical science)

Associated Concepts:

1. Science deals only with natural patterns and mechanisms.
2. Scientific knowledge is uncertain, tentative and subject to revision.

Assessable Objectives

1. Students will recognize that historical science is just as valid as experimental science
2. Students will recognize examples of historical science *vis a vis* experimental science
3. Students will recognize that science is limited to natural explanations of natural phenomena
4. Students will recognize that alternative conclusions (explanations) can apply, and favored conclusions can change with new information, new techniques, and/or new interpretations.

Materials

Student Handouts (see below)
Teacher Information (available upon request)

Time

One 45-minute period

Student Handouts & Worksheets

“Case Report of a Botanical Crime Scene,” with the assigned task and suggested URLs
Six photographs showing evidence from the crime scene

Teaching Strategy & Preparation

This lesson can be offered in the context of your introductory unit on the nature of science. The suggested websites can provide the botanical background to analyze the evidence. In fact, this scenario could be used as an opening experience for your students, to which subsequent experiences in class can refer. The legitimate process of science that this lesson exemplifies provides an important counterpoint to the usual “Scientific Method” of experimental science, often the only scientific process students encounter. The “historical process” of science is critical to understanding how science works in several fields, including astronomy, paleontology, evolutionary biology, and geology.

This lesson could also be used as an application experience following class work on plant structures and plant growth, effectively integrating a valuable process of science with its content.

Prepare enough copies of the Case Report and photographs so that each team of 2-4 will have a set. If computer access is not available, provide printouts of pertinent material on the suggested websites. Alternatively, if at least one person on each team has access to a computer (home, library), that person can be the resource person who can gather the information and report back to the team with copies of that evidence.

Procedures

Student teams are to read the Case Report, study the photos, discuss and plan their strategy for fulfilling the assigned task. Then they must assign the working tasks to each team member.

Each team compiles and writes its report. Probably the most valuable follow up would be to have a representative from each team share the team's concise conclusions with the class. List the conclusions on the board in a brief fashion as presented. When all conclusions are in, engage the class in assessing those conclusions. Encourage them to ask selected teams to explain how they arrived at particular elements of their conclusions, and to offer alternative explanations, focusing on their relative strengths and weaknesses. Be sure that students critique the *explanations* or the *process*, not the team or its members.

For example of a reasonable Timeline, and possible causes of the death of the victim, contact the webmaster with your school email address and/or clear evidence of your position as a teacher.

Assessment & Evaluation

1. Given examples of various studies, students can recognize which are examples of historical science, and which are examples of experimental science.
2. Given examples of explanations for this botanical crime scene, students can distinguish which are inappropriate for science (invoke supernatural forces), pseudoscience (use psychokinesis, etc.), poorly done science (fail to account for all the data), based on historical analysis, or based on experimental analysis
3. If more than one equally viable explanation is offered, indicate what information would be needed to resolve the dispute.
4. What assumptions are made about the data (information and pictures) and the validity of the resources?

Extensions & Variations

Doing another "Crime Scene" lesson (or more) would reinforce much of the concepts from this lesson.

Other Resources

Encourage students to seek other resources that might shed more light on the analysis.

Attributions

This lesson was created and developed in 2004 by Michael Kimmel, ENSI '91, Ohio OBTA for 2001, currently Program Director for the Master of Arts in Integrated Science for Teachers at John Carroll University in University Heights, OH. Email: mkimmel@jcu.edu.

Lesson introduced and adapted to the ENSI format by Larry Flammer, July 2005.