



Education and Research: Testing Hypotheses

Lesson Plan—The SOFeX Expedition

Summary

This activity will help students understand the rationale, questions, research, technology and people involved in the Southern Ocean Iron Experiment (SOFeX) Cruise in 2002.

Key Concepts

- Technology is essential to science for such purposes as access to outer space and other remote locations, sample collection and treatment, measurement, data collection and storage, computation, and communication of information.
- Human beings are part of the earth's ecosystems. Human activities can, deliberately or inadvertently, alter the equilibrium in ecosystems.

Objectives

Students will be able to:

- **Describe** different methods used by scientists to carry out deep-ocean research
- **Explain** the rationale, questions, research, technology and people involved in the SOFeX Cruise

Materials

- Computers with Internet access
- SOFeX Cruise Information Sheet
- Presentation materials (PowerPoint, paper, pens, markers, etc.)

Procedure

1. Have students begin by reading the overview and of the SOFeX project:
 - Overview—<http://www.mbari.org/expeditions/SOFeX2002/>
 - Purpose—<http://www.mbari.org/expeditions/SOFeX2002/history&purpose.htm>
2. Divide the class into small groups and have each group discuss the following questions:
 - What is the aim of the SOFeX Project?
 - What specific questions do you think scientists will seek to answer during the cruise?
 - How do you think scientists will go about their investigations during the cruise?
 - How will the results of this cruise help scientists understand the global carbon cycle, atmospheric carbon dioxide concentration and climate control?
3. Have students explore the cruise logbook, and the equipment and people pages:
 - Logbook— <http://www.mbari.org/expeditions/SOFeX2002/Logbook.htm>
 - Equipment— <http://www.mbari.org/expeditions/SOFeX2002/gear.htm>
 - People— <http://www.mbari.org/expeditions/SOFeX2002/interviews.htm>
4. Have students work in small groups to complete the SOFeX Cruise information sheet.
5. Have each group prepare a “request for funding” brochure for the SOFeX Cruise, using information they have found throughout their investigation. Students should include information on goals, rationale and purpose of the cruise; questions to be investigated; equipment and technology; and people involved.
6. Have each group post their funding brochure or distribute to other groups to evaluate.

Assessment

- **Performance**—Did student participate in discussion sessions and demonstrate an understanding of the rationale, questions and research involved in the SOFeX cruise?
- **Product**—Did student accurately complete SOFeX Cruise Information Sheet? Did students’ brochure accurately present the background information about the cruise? Did students include all requested aspects of the cruise in their brochure?

Cruise Specifications:

What are the dates of the SOFeX project?

What ships are involved in the project?

Where will the ships depart from?

Where will the experiment take place?

How many scientists are involved in the project?

How many institutions are involved?

Who are the chief scientists on each vessel, and what institutions are they from?

Cruise History:

What is John Martin's hypothesis of ice ages?

What is a likely limiting factor of primary production in high nitrate, low chlorophyll (HNLC) waters, such as the Southern Ocean?

Why are scientists planning to complete two iron enrichment experiments during the expedition, in different areas?

Cruise Procedures:

What will the primary mission of the *Revelle* be during its six-week cruise?

What specific procedures will the *Revelle* complete during its six-week cruise?

What measurements will the *Melville* be taking during its six-week cruise?

What will the *Polar Star* focus on during its six-week cruise?

Cruise Equipment:

How will the iron be delivered to the Southern Ocean?

Why will SF₆ be added to the iron?

What will scientists use drifters for during this experiment?

How will scientists take vertical profile samples?

What will these vertical profile measurements be used for?

What is SeaSoar and what will it be used for?

What advantage does SeaSoar provide over other shipboard mapping techniques?

How will shipboard mapping of nutrients will be performed?

Where will Multi-Particle Interceptor Traps (PITS) be deployed and what information will they provide?

What will Multiple Large Volume Filtration Systems be used for and how will this determine if iron fertilization leads to carbon sequestration?

Why will Radiation Vans (Rad Vans) and desktop incubators be required?

Cruise Participants:

Each member of your group should choose one cruise participant and answer the following questions:

Participant name:

What institution is he/she from?

What is his/her specialization (i.e., Chemistry, Engineering, Biology, Oceanography, etc.)?

What is his/her role on the SOFeX Cruise?

What is his/her primary goal for the SOFeX Cruise?

Why did he/she decide to become a scientist/engineer?