

Teacher's Guide

This module will guide students in an exploration of mining as it relates to their local communities and environment. The module is designed to start with the introductory presentation, Mining and the Environment. Students will then begin on a group research projects exploring different aspects of mining. The final activity is an optional lab investigating acid mine drainage and dissolved oxygen. Please note that the lab requires specialized equipment.

Objectives

- 1) Students understand the local history of mining and the societal significance of mining.
- 2) Students understand how surface mining, underground mining, and milling and processing work.
- 3) Students understand the impact mining can have on water quality and the environment.
- 4) Students understand water chemistry changes related to acid mine drainage.

Estimated Time

Total: 8-10 hours
Presentation: 30-45 minutes
Research Activity: 5-6 hours
Lab Activity: 2-3 hours

Activities

The Mining and the Environment Presentation will be presented by the teacher and introduces students to mining and its impacts, with a focus on mining in Park County. The presentation will give students a basic understanding of mining that they will build on through the rest of the module.

The Mining History and Methods Research Activity will start after the introductory presentation. This activity will allow students to practice valuable research and presentation skills while gaining a deeper understanding of scientific, historical, and social aspects of mining through a collaborative, group process. Students will work in groups to explore the history and social aspects of mining; surface mining; underground mining; and milling and processing. Students will start by filling in worksheets for their topics, and then create and deliver short presentations to teach the rest of the class about their mining topic. A resource guide is included in this module, and provides documents, articles, books, and websites students can explore to complete their

research project. Many of the books can be checked out at the public library; others may be available to borrow from CUSP staff.

The Acid Mine Drainage and Dissolved Oxygen Lab is an optional activity that allows students to get hands-on experience investigating water chemistry. The lab explores how dissolved oxygen concentrations change as pollutants common to acid mine drainage are introduced into water. *Please note that the lab requires specialized equipment that may need to be purchased.*

Supplies

Introduction Presentation

Mining and the Environment PowerPoint Presentation
Presentation capabilities

Mining History and Methods Research Activity

History and Social Aspects of Mining Worksheets (1 per student in this group)
Surface Mining Worksheets (1 per student in this group)
Underground Mining Worksheets (1 per student in this group)
Milling and Processing Worksheets (1 per student in this group)

Mining History and Methods Resource List (1 per student)

Note that many of the books listed in the resource list for this activity can be checked out at the public library; others may be available to borrow from CUSP staff.

Acid Mine Drainage and Dissolved Oxygen Lab

One of two interfaces, PASPORT or Science Workshop, can be used for this lab. Supplies will differ based on the interface chosen.

PASPORT Interface

Dissolved Oxygen Sensor with soaker bottle PS-2108
Xplorer GLX PS-2002 or other PASPORT Interface
Distilled or deionized water
1 mL each of 2-M sodium sulfite solution and 2-M sodium nitrate solution
Clamps and lab stand as needed to suspend sensor in solution
2 600-mL beakers
Large and small graduated cylinder (or pipette)
Stirring rod
Wash bottles for rinsing sensors
Optional: magnetic stir bar setup

2-M sodium sulfite solution (25.2 g Na₂SO₃ / 100 mL)
2-M sodium nitrate solution (17 g NaNO₃ / 100 mL)
Large bottle or aquarium pump to aerate water
Optional: pH Sensor PS-2102

Science Workshop Interface

Dissolved Oxygen Sensor with soaker bottle CI-6542
750 Interface, USB CI-7650 or other ScienceWorkshop Interface
Distilled or deionized water
1 mL each of 2-M sodium sulfite solution and 2-M sodium nitrate solution
Clamps and lab stand as needed to suspend sensor in solution
2 600-mL beakers
Large and small graduated cylinder (or pipette)
Stirring rod
Wash bottles for rinsing sensors
Optional: magnetic stir bar setup
2-M sodium sulfite solution (25.2 g Na₂SO₃ / 100 mL)
2-M sodium nitrate solution (17 g NaNO₃ / 100 mL)
Large bottle or aquarium pump to aerate water
Optional: pH Sensor CI-6507A

Please refer to the Objectives, Standards, and STEM Connections document for more information about how this module ties into Colorado State Standards and Science, Technology, Engineering, and Math (STEM) concepts.