Rocks and Minerals
Grade 4

Investigate New Mexico’s rich geological past and present.

This program was designed for use in the classroom, at the garden, and then back in the classroom. It is composed of a series of readings and hands-on activities. Although it is not necessary to complete the pre and post work, it will deepen and enrich the experience of the unit. The lessons that are listed before the fieldtrip are designed and pre-lessons, and the

Overview of Unit:
• Pre-assessment
• Rock collection and categorization
• Rock cycle
• Igneous Rocks
• Metamorphic Rocks
• Sedimentary Rocks
• Re-categorize collected rocks
• Field Trip
  o Rock id chart
  o Santa Fe Geology – Giant map with rocks from local areas
  o Water cycle and Erosion
• Schoolyard Erosion
• Infiltration and runoff experiment
• Recommend erosion control for school
• Post-assessment
• Glossary

Students will know:
• Related vocabulary
• How rocks are formed
• How to use specific characteristics to make an identification
• How New Mexico was formed
• The impact of weather on rocks and erosion

Students will be able to:
• Create a mini glossary
• Read nonfiction text and respond
• Support ideas with evidence
• Learn directly from nature through making careful observations
• Apply knowledge to a new task
• Use drawing to record data or information
• Understand a chart
• Conduct a field study
• Use the scientific method to conduct an experiment and revise a plan
• Use scientific tools

Links to Standards
• Common Core
  o ELA
    ▪ CCSS.ELA-Literacy.RI.4.1
    ▪ CCSS.ELA-Literacy.RI.4.3
    ▪ CCSS.ELA-Literacy.RI.4.4
    ▪ CCSS.ELA-Literacy.RI.4.7
    ▪ CCSS.ELA-Literacy.RI.4.9
    ▪ CCSS.ELA-Literacy.RI.4.10
    ▪ CCSS.ELA-Literacy.W.4.2
    ▪ CCSS.ELA-Literacy.W.4.8
    ▪ CCSS.ELA-Literacy.SL.4.1
    ▪ CCSS.ELA-Literacy.L.4.4
    ▪ CCSS.ELA-Literacy.L.4.6
• Next Generations Science Standards
  o Coming Soon…
• NM Science Standards
  o Strand 1, Standard 1, Grade 4, Benchmark 1, #1, #3
  o Strand 1, Standard 1, Grade 4, Benchmark 2, #1, #3
  o Strand 2, Standard 3, Grade 4, Benchmark 2, #1

Lesson Plans:
• Pre-assessment
  o Purpose:
    ▪ Assess what students already know about the topic
    ▪ Ask students to support their thinking with evidence
  o Time:
    ▪ 15 minutes

• Rock Walk
  o Purpose:
    ▪ Build interest in rocks and minerals
    ▪ Practice categorizing based on physical features
  o Time:
    ▪ 45 minutes
  o Materials:
    ▪ Bags
    ▪ Sharpie or permanent marker
    ▪ Magnifying glasses
  o Intended Structure:
- **Anticipatory Set:**
  - Set expectations about an outside walk
  - If weather is bad or there are not rock, go into any arroyo and collect a large selection of rocks, bringing them into your classroom and letting students chose their own rocks

- **Activity:**
  - Go on a 10-15 minute rock walk
  - Discuss how to make close observations, using senses and
  - Have students observe each rock closely, writing what they notice using detail
  - Have students sort the rocks with their group mates in three different ways (E.g. size, color, and texture)

- **Closing:**
  - Have students ask questions they would like to know about their rocks
  - Record the questions on chart paper or on a smart board

- **The Rock Cycle and other Rock Readings, Pgs 4, 6, 7, and 8**
  - **Purpose**
    - Examine text features of nonfiction text
    - Learn about rocks and how they are formed
  - **Time**
    - Four 20 minute reading sessions
  - **Intended structure**
    - **Anticipatory Set:**
      - Start by giving students about 30 seconds to assess what each paragraph is about
      - Ask students why they know that is what they think they will read
    - **Activity:**
      - Read the paragraphs in a way that is appropriate for your students, independently, in small groups, or through guided reading
    - **Closing:**
      - Have students record bold words in glossary

- **Raisin Mining**
  - **Purpose**
    - Explore the difference between rocks and minerals
    - Understand the sometimes minerals are clumped together, and can be seen
    - Sometimes minerals are mixed together and can not be discerned or separated easily
• Use a familiar object to represent similarities with a less familiar object
  o **Time**
    ▪ 45 minutes
  o **Materials:**
    ▪ Raisin bread
    ▪ Toothpicks
    ▪ Timer
  o **Intended Structure**
    ▪ Anticipatory Set:
      • Explain the challenge
      • Challenge: Students must separate the primary ingredients of the raisin bread into piles. Students will be unable to do this
    ▪ Activity:
      • Have students attempt the challenge
    ▪ Closing:
      • Reflect on similarities between the ingredients and minerals
      • Reflect on the similarities between the bread and rocks

• **Re-categorize the Rocks**
  o **Purpose:**
    ▪ Have students apply their knowledge about how rocks are formed to the rocks they collected, using reading to learn about the world around them
    ▪ Have students
  o **Time:**
    ▪ 30-40 minutes
  o **Materials:**
    ▪ Rocks collected in Lesson 1
    ▪ Hand lenses
  o **Intended Structure:**
    ▪ Anticipatory Set:
      • Review the three primary categories of rocks
        o Igneous
        o Metamorphic
        o Sedimentary
      • Ask students what each is and how they might be able to recognize these types of rocks, employ the glossary as well
    ▪ Activity:
      • Have students look at the rocks in their groups
      • Have them sort the rocks into the three categories discussed above
      • Use these categories to make some hypotheses about the area where these rocks were collected
    ▪ Closing:
• Discuss how the land around Santa Fe was formed
  o Sangre de Cristo – Precambrian metamorphic rocks
  o Rio Grande – this is a rift valley, it is spreading apart as the plates move, it is filled with semi-hardened sediment, this is called the Santa Fe Formation
  o Area around Los Alamos – volcanic layers, much was built up when the super volcano exploded, which is centered in what is now called the Valle Grande

• Field Trip
  o Structure of Field Trip
    ▪ 15 minutes – Begin as a group
    ▪ 90 minutes – Rotate through 3 Activities
    ▪ 15 minutes – Closing activity as a group
    ▪ Time for teacher and class to explore
  o Rotations in the Botanical Garden
    ▪ Rock Identification
    ▪ Geology of Santa Fe
    ▪ Erosion and Sedimentary Rock Exploration

• Water Cycle
  o Purpose
    ▪ Connect the trip to the garden and exploration of erosion to the natural process of the water cycle
    ▪ Continue to build an understanding of the interactions between weather and geology
    ▪ Build a model that represents a complex system
  o Time
    ▪ Depends on desired level of complexity one to four 45 minute sessions
  o Materials
    ▪ Your choice
    ▪ Suggested:
      ▪ Recycled materials
      ▪ Clay
      ▪ Sponges
      ▪ Water
      ▪ Tupperware
      ▪ Straws
      ▪ Beads
      ▪ Plastic wrap
      ▪ Fun foam
  o Intended structure
    ▪ Anticipatory Set:
• Discuss the water cycle
• Have students brainstorm the parts of the water cycle
• Show them examples of the water cycle
• Have them make a list of the most important parts, which you will expect them to incorporate into their model
• Have them work in small groups

  ▪ Activity:
    • Challenge students to build a model of the water cycle using the given materials
    • They should start by making a plan, then build and label the model

  ▪ Closing:
    • Have students share the models, explaining why they built what they did

• Schoolyard Water

  o Purpose
    ▪ Explore how large physical process impact the local environment
    ▪ Make a map through exploration and investigation
    ▪ Apply knowledge to a real world situation

  o Time
    ▪ 45 minutes

  o Materials
    ▪ Use Google or other source to print maps of the school
    ▪ Clipboards
    ▪ Markers
    ▪ Pitchers of water

  o Intended structure
    ▪ Anticipatory Set:
      • Ask students when they see parts of the water cycle at school
      • Define and review erosion
      • Set rules for outdoor exploration
    ▪ Activity:
      • Choose 3 areas and spend 7-10 minutes in each area
      • Have students make water maps of the school
      • Consider having them include:
        o Color coded key
        o Where water pools
        o Where you have runoff
        o Where water infiltrates
        o Canales
        o Water collection by people
        o Arroyos
    ▪ Closing:
      • Share the maps
Infiltrate or Runoff?

- **Purpose**
  - Conduct a scientific investigation, following the scientific method
  - Conduct an investigation of the local environment, which will lead to action
  - Have students make decisions about what to test and consider what this tells us

- **Time**
  - 1 hour

- **Intended structure**
  - **Anticipatory Set:**
    - Discuss why water sometimes erodes and sometimes infiltrates
    - Discuss specific areas that students noticed were eroding or had water moving across them from the mapping project
  - **Activity:**
    - Have students choose 3 different soils to test
    - Follow the procedures
    - Important: all three slopes should be close to the same angle, or the results will not mean anything
  - **Closing:**
    - Discuss what this tells you
      - E.g. The water ran a long way on the cement, so it didn’t infiltrate very much, but it soaked in almost immediately on the sand
    - Discuss why you want water to infiltrate
    - Ask them what is stopping this
    - Ask them what could be done to help more water to infiltrate
    - Have students complete page 16, a series of recommendations to you and the administration about changes that could be made or areas that they see are problematic

- **Post-assessment**
  - **Purpose**
    - Assesses students' knowledge after the unit
  - **Time**
    - 15-20 minutes
  - **Intended structure**
    - Students should independently take the assessment