MULTI STEM Fall 2018 Earth as a System & the Rock Cycle-Denver

Auraria

JANELLE JOHNSON NOV 29, 2018 08:11AM

Introductions

JANELLE JOHNSON NOV 29, 2018 09:05AM

Quick look at Padlet

How to find other resources
Remaking the modules
"Like" the padlet for ease
Other questions?

Hi, my name is Tara Kimmey and I am a Middle School Science Teacher at Colorado STEM Academy. My focal students are level 6s and 7s. They enjoy science, but it's hard to find resources and labs on their reading levels. — TARA KIMMEY

JANELLE JOHNSON NOV 29, 2018 09:06AM

Please introduce yourself here

And describe your focal students please!

Hello, My name is Mariska Hamstra. I will be student teaching at Lakewood High next semester. — MARISKAHAMSTRA

I'm Tony Bullock, I teach Chemistry and Physical science at Gateway High School in Aurora. I love working with students who are considered "high risk", and have done so for 23 years. — TONY BULLOCK

Good Morning! I am Emily Heinrich and I teach 6th grade science at Discovery Canyon Middle School in Colorado Springs, My focal students are both boys and girls who struggle in the area of literacy. My goal is to use science to engage them in text and materials that extend their current literacy level by raising their interest level. — EMILY HEINRICH

Hello, I am Lisa Busch. I teach 5th grade at Pikes Peak School of Expeditionary Learning. We are an EL school and our current expedition is about Earth systems. We are currently creating environmental action plans to recommend ways to reduce our school's carbon footprint. — EMILY HEINRICH

JANELLE JOHNSON NOV 29, 2018 09:06AM

Our definition of STEM

From Outlier Research: "In all cases, it is clear that some of the most valued components of STEM schools are not STEM-discipline specific, but relate to broader, transferrable, lifelong skills...Educational philosophers such as Dewey, Piaget, Vygotsky, and Bruner have advocated for inquiry and constructivist approaches for over a century. They argued for student autonomy, relevance, collaboration with peers, and learning-by-doing."

JANELLE JOHNSON NOV 29, 2018 09:05AM

MULTI

Funded by NSF
Community based approach--Check out FB and Twitter!
Focus on teacher PD to more effectively engage underserved students
Earth systems science based learning activities--GLOBE (Global Learning & Observations to Benefit the Environment)
Workshops & research on implementation
Our research: STEM content, 21st century skills, career pathways
Questions about follow up?

MULTI
A MULTI Approach to Engaging Students and Teachers in Effective STEM Education
MSUDENVER

JANELLE JOHNSON NOV 29, 2018 09:05AM

Student Research

2018 International Virtual Science Symposium - GLOBE.gov

2018 GLOBE International Virtual Science Symposium

GLOBE is excited to host the 2018 GLOBE International Virtual Science Symposium (IVSS). The IVSS is a way for students from all GLOBE countries to showcase their hard work. With GLOBE, students learn the practices of science through hands-on investigations in their own communities, sparking their curiosity and interest in science.

GLOBE

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GLOBE Mission Mosquito campaign

Mission Mosquito - GLOBE.gov

The goal of GLOBE Mission Mosquito is to create an organized citizen science community - primarily through formal education, with targeted outreach to informal education - that will conduct and report local observations using the GLOBE Observer Mosquito Habitat Mapper (GO MHM).

GLOBE

JANELLE JOHNSON NOV 29, 2018 09:03AM

GLOBE Heat Island campaign

UHIE-Surface Temperature - GLOBE.gov

Surface Temperature Campaign is not new to the GLOBE Program. The data collection for the Surface Temperature Protocol Campaign as mentioned on the GLOBE website is being done in December when snow occurs. The campaign will encourage individuals to take daily measurements when doing the atmosphere protocols.

GLOBE

JANELLE JOHNSON NOV 29, 2018 08:11AM

GLOBE: Earth as a System

Perceiving Earth as a system begins when we first feel warmth from sunshine or get wet standing in the rain. Understanding Earth as a system – Earth System Science – requires a quantitative exploration of the connections among all parts (atmosphere, hydrosphere, lithosphere, and biosphere) of the system. The measurements of The GLOBE Program provide students with the means to begin this exploration for themselves.

The processes comprising the global environment are interconnected. Many of the major environmental issues of our time have driven scientists to study how these connections operate on a global basis – to understand Earth as a system.


Introduction

Why Study Earth System Science?

Perceiving Earth as a system begins when we first feel warmth from sunshine or get wet standing in the rain. Understanding Earth as a system – Earth System Science – requires a quantitative exploration of the connections among all parts (atmosphere, hydrosphere, lithosphere, and biosphere) of the system. The measurements of The GLOBE Program provide students with the means to begin this exploration for themselves.

The processes comprising the global environment are interconnected. Many of the major environmental issues of our time have driven scientists to study how these connections operate on a global basis – to understand Earth as a system.

Studies of the stratospheric ozone layer involve questions about the processes which create and destroy ozone. Scientists have learned that ozone, a chemical primarily found in a layer centered about 25 km above Earth's surface, is connected to biological activity happening in the soil on Earth's surface. Different chemicals, present in the air in trace amounts, control the abundance of ozone in the atmosphere. The sources of these trace constituents include microorganisms in the soil and water, land plants, and even some animals along with human activity.

Scientists studying climate change are also interested in the connections among the different Earth processes. Some of the trace gases in the atmosphere make it more difficult for heat (infrared radiation) to escape from Earth's surface to space. The amounts of these greenhouse gases found in the atmosphere are tied to the physical, chemical, and biological processes taking place in soil and water and on land. They are also influenced by the circulation of the oceans and atmosphere. To predict the future course of the climate we need to understand this detailed fabric of connections.

Ecologists study the way in which the living and non-living components of an ecosystem interact. Individual organisms and species compete and cooperate with one another. In some cases, interdependence is so strong that different plants and animals cannot reproduce or even exist without each other. There is a web of life with extensive recycling of nutrients, and each organism plays a role. If one component of the ecosystem is changed the effects ripple through the system.

Scientists do not know all the Earth system connections yet, but they keep working to gain a more complete understanding. GLOBE students can help through data collection and student research. GLOBE students and scientists working together will improve our understanding of the Earth system. As students conduct a wide range of GLOBE measurements (perhaps spread over several school years in multiple grades), they should gain a perception that the environment is the result of an interplay among many processes that take place locally, regionally, and globally on time scales ranging from seconds to centuries. This is a key GLOBE lesson. The learning activities in this chapter help students learn this as they study annual variations in environmental parameters (the *Seasons* section) and examine the connections among the various phenomena measured in GLOBE on local, regional, and global spatial scales (the *Exploring the Connections* section).

The Big Picture

The planet we call Earth is made up of five 'spheres', the atmosphere, hydrosphere, lithosphere, cryosphere, and biosphere, connected to each other in a complex web of processes. See Figure EA-I-1. The atmosphere consists of the gases and particles suspended in the air. The oceans, inland water bodies, ground water, and ice sheets (cryosphere), comprise the hydrosphere. The lithosphere refers to the solid earth; the core, mantle, crust, and soil layers (pedosphere). The places on Earth where organisms live are collectively known as the biosphere. Instead of focusing on the individual parts of Earth, Earth system scientists use chemistry, biology, and physics to study the cycles that connect these spheres with each other and with the energy from the sun, which ultimately drives almost all of these processes.

GLOBE® 2014 Introduction - 1 Earth System Science

Welcome | Introduction | Protocols | Learning Activities | Appendix

Earth_as_a_System_Introduction.pdf

PDF document

PADLET DRIVE

What's the phenomenon/problem?

JANELLE JOHNSON NOV 29, 2018 08:11AM

Essential questions or statement of problem

Example: The amount of carbon entering the earth's atmosphere continues to increase. What are some possible actions we can take to address the problem?

The Earth System
by GeoScience Videos
YOUTUBE

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CAS 2020

Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. (MS-ESS2-1) (*Clarification Statement: Emphasis is on the processes of melting, crystallization, weathering, deformation, and sedimentation, which act together to form minerals and rocks through the cycling of Earth's materials.*)

Colorado Essential Skills and Science and Engineering Practices:

1. Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (Constructing Explanations and Designing Solutions) (Entrepreneurial: Creativity/Innovation)

Information & resources

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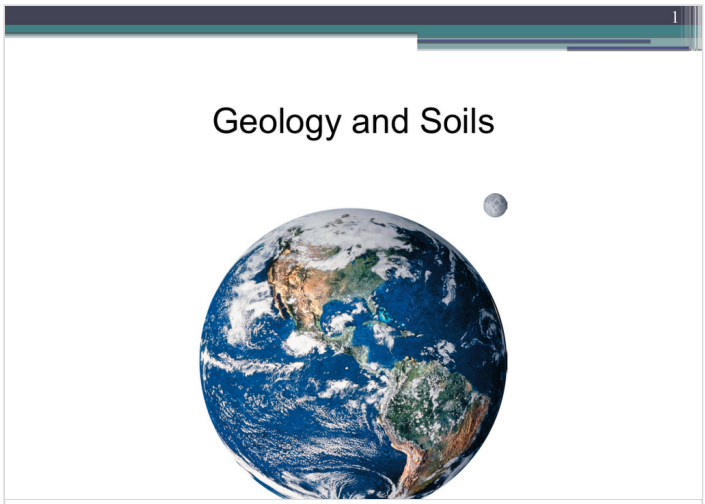
GLOBE Resources

GLOBE Resources
This list of links and notes are resources from GLOBE that may be helpful to your overall GLOBE work.
PADLET

JANELLE JOHNSON NOV 29, 2018 08:32AM

Earth as a System & the Rock Cycle talk



Geology_soils.pptx
Powerpoint presentation
PADLET DRIVE

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What happened to the scientific method?

"This approach often obscures or distorts the processes of inquiry as they are practiced by scientists. Practices, such as reasoning carefully about the implications of models and theories; framing questions and hypotheses
so that they can be productively investigated; systematically analyzing and integrating data to serve as evidence to evaluate claims; and communicating and critiquing ideas in a scientific community are vital parts of inquiry. However, they tend to be missed when students are taught a scripted procedure designed to
obtain a particular result in a decontextualized investigation. Furthermore, these higher-level reasoning and problem-solving practices require a reasonable depth of familiarity with the content of a given scientific topic if students are to engage in them in a meaningful way. Debates over content versus process are not in step with the current views of the nature of science.... Science is seen as a fundamentally social enterprise that is aimed at advancing knowledge through the development of theories and models that have explanatory and
predictive power and that are grounded in evidence. In practice this means that content and process are deeply intertwined."(NRC, 2012b, p. 127)

JANELLE JOHNSON NOV 29, 2018 08:38AM

Trapping carbon in rocks

Science News for Students

Scientists find an easier way to trap carbon dioxide in rock

Scientists have found a much faster and easier way to trap CO2 in minerals. If they can scale it up, it might one day help to slow climate change.

SCIENCE NEWS FOR STUDENTS

JANELLE JOHNSON NOV 29, 2018 08:49AM

Bill Nye video on erosion

Bill Nye Erosion

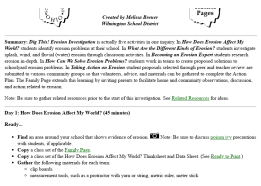
Erosion

@SCHOOLTUBE

JANELLE JOHNSON NOV 29, 2018 08:52AM

Erosion at My School

Lesson Plan

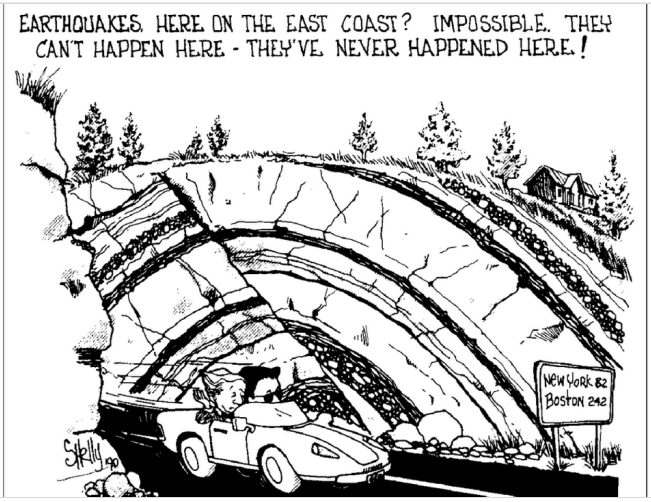


Summary: Dig This! Erosion Investigation is actually five activities in one inquiry. InHow Does Erosion Affect My World? students identify erosion problems at their school. InWhat Are the Different Kinds of Erosion? students investigate splash, wind, and fluvial (water) erosion through classroom activities. InBecoming an Erosion Expert students research erosion in-depth.

MIAMIOH

RANDI BRAZEAU DEC 01, 2018 10:19AM

Mineral Properties Lecture



Multi_Mineral_Characteristics.pptx

Powerpoint presentation

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RANDI BRAZEAU DEC 01, 2018 10:38AM

Link to Purchase Mineral Kits

Mineral Test Kit

Supplies students with the necessary tools for rock, mineral, and fossil identification. The Test Kit includes streak plate, glass plate, hand lens, dropper bottle, magnet, nail, penny, and hardness scale. Comes in a zip-lock pouch. Grades 4 - 10.

FORESTRY SUPPLIERS, INC.

RANDI BRAZEAU DEC 01, 2018 10:38AM

Classroom Set of Minerals

Physical Properties of Minerals Collection

Ideal for introducing students to the physical properties of minerals like hardness, luster, cleavage and how these properties help in mineral identification. Suggested student activities are provided along with testing tools (streak & glass plates, nail, penny, & magnifier). 30 Specimens each measure approximately 1" in size.

FORESTRY SUPPLIERS, INC.

RANDI BRAZEAU DEC 01, 2018 10:38AM

Classroom Rock Sets

Rock Collections

Each collection contains 15 specimens representative of each type of rock. Rocks are 1-1/2" x 1-1/2" in size and are number-coded for identification. Stored in a compartmented container. Grades 5-12.

FORESTRY SUPPLIERS, INC.

RANDI BRAZEAU DEC 01, 2018 11:10AM

Soil Corer

Oakfield Model H Tube Sampler Soil Probe

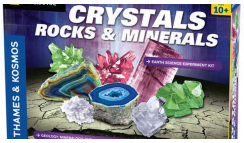
Constructed of nickel-chrome plated, 16-gauge steel to resist abrasion, plus all parts are interchangeable! Augers are 1-1/4" in diameter, have double twist with 2-1/4" pitch. The auger sections are 8" long with 4" shanks. Thread-on features 1/2" x 13 threads per inch. Tubes are designed to eliminate friction in the tube after cutting the sample.

FORESTRY SUPPLIERS, INC.

RANDI BRAZEAU DEC 01, 2018 11:36AM

Crystal Growing and Mineral Investigation Kit

Crystals, Rocks and Minerals Kit



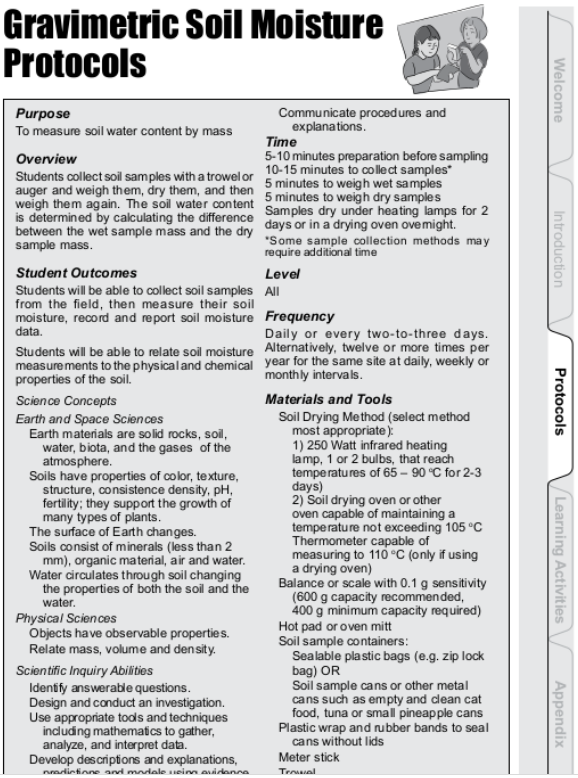
More than just a crystal growing kit, this experiment kit teaches the chemistry of crystals and the geological science behind rock formation with more than 18 hands-on projects and investigations. Grow three chemically different types of crystals that exhibit not only different colors, but also different crystal shapes.

FORESTRY SUPPLIERS, INC.

Labs & Data Collection

JANELLE JOHNSON NOV 29, 2018 08:31AM

GLOBE Soil Protocol



Gravimetric Soil Moisture Protocols

Purpose
To measure soil water content by mass

Overview
Students collect soil samples with a trowel or auger and weigh them, dry them, and then weigh them again. The soil water content is determined by calculating the difference between the wet sample mass and the dry sample mass.

Student Outcomes
Students will be able to collect soil samples from the field, then measure their soil moisture, record and report soil moisture data.

Students will be able to relate soil moisture measurements to the physical and chemical properties of the soil.

Science Concepts
Earth and Space Sciences
- Earth materials are solid rocks, soil, water, biota, and the gases of the atmosphere.
- Soils have properties of color, texture, structure, consistence density, pH, fertility; they support the growth of many types of plants.
- The surface of Earth changes.
- Soils consist of minerals (less than 2 mm), organic material, air and water.
- Water circulates through soil changing the properties of both the soil and the water.

Physical Sciences
- Objects have observable properties.
- Relate mass, volume and density.

Scientific Inquiry Abilities
- Identify answerable questions.
- Design and conduct an investigation.
- Use appropriate tools and techniques including mathematics to gather, analyze, and interpret data.
- Develop descriptions and explanations, predictions and models using evidence
- Communicate procedures and explanations.

Time
5-10 minutes preparation before sampling
10-15 minutes to collect samples*
5 minutes to weigh wet samples
5 minutes to weigh dry samples
Samples dry under heating lamps for 2 days or in a drying oven overnight.
*Some sample collection methods may require additional time

Level
All

Frequency
Daily or every two-to-three days. Alternatively, twelve or more times per year for the same site at daily, weekly or monthly intervals.

Materials and Tools
- Soil Drying Method (select method most appropriate):
  1) 250 Watt infrared heating lamp, 1 or 2 bulbs, that reach temperatures of 65 – 90 °C for 2-3 days)
  2) Soil drying oven or other oven capable of maintaining a temperature not exceeding 105 °C
  Thermometer capable of measuring to 110 °C (only if using a drying oven)
- Balance or scale with 0.1 g sensitivity (600 g capacity recommended, 400 g minimum capacity required)
- Hot pad or oven mitt
- Soil sample containers:
  Sealable plastic bags (e.g. zip lock bag) OR
  Soil sample cans or other metal cans such as empty and clean cat food, tuna or small pineapple cans
- Plastic wrap and rubber bands to seal cans without lids
- Meter stick
- Trowel

Welcome | Introduction | Protocols | Learning Activities | Appendix

Soil_Moisture___Gravimetric_protocol.pdf

PDF document

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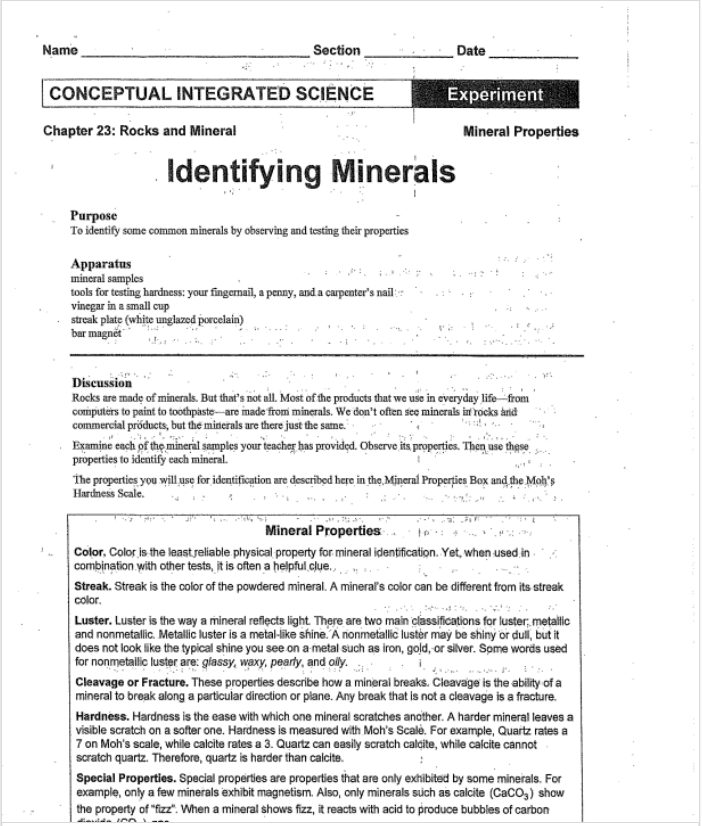
RANDI BRAZEAU DEC 01, 2018 08:39AM

Mineral and Rock Identification Labs



Name _____ Section _____ Date _____

CONCEPTUAL INTEGRATED SCIENCE | Experiment

Chapter 23: Rocks and Mineral | Mineral Properties

Identifying Minerals

Purpose
To identify some common minerals by observing and testing their properties

Apparatus
mineral samples
tools for testing hardness: your fingernail, a penny, and a carpenter's nail
vinegar in a small cup
streak plate (white unglazed porcelain)
bar magnet

Discussion
Rocks are made of minerals. But that's not all. Most of the products that we use in everyday life—from computers to paint to toothpaste—are made from minerals. We don't often see minerals in rocks and commercial products, but the minerals are there just the same.

Examine each of the mineral samples your teacher has provided. Observe its properties. Then use these properties to identify each mineral.

The properties you will use for identification are described here in the Mineral Properties Box and the Moh's Hardness Scale.

Mineral Properties

Color. Color is the least reliable physical property for mineral identification. Yet, when used in combination with other tests, it is often a helpful clue.

Streak. Streak is the color of the powdered mineral. A mineral's color can be different from its streak color.

Luster. Luster is the way a mineral reflects light. There are two main classifications for luster: metallic and nonmetallic. Metallic luster is a metal-like shine. A nonmetallic luster may be shiny or dull, but it does not look like the typical shine you see on a metal such as iron, gold, or silver. Some words used for nonmetallic luster are: *glassy, waxy, pearly,* and *oily.*

Cleavage or Fracture. These properties describe how a mineral breaks. Cleavage is the ability of a mineral to break along a particular direction or plane. Any break that is not a cleavage is a fracture.

Hardness. Hardness is the ease with which one mineral scratches another. A harder mineral leaves a visible scratch on a softer one. Hardness is measured with Moh's Scale. For example, Quartz rates a 7 on Moh's scale, while calcite rates a 3. Quartz can easily scratch calcite, while calcite cannot scratch quartz. Therefore, quartz is harder than calcite.

Special Properties. Special properties are properties that are only exhibited by some minerals. For example, only a few minerals exhibit magnetism. Also, only minerals such as calcite ($CaCO_3$) show the property of "fizz". When a mineral shows fizz, it reacts with acid to produce bubbles of carbon

Rocks_and_Minerals.pdf
PDF document
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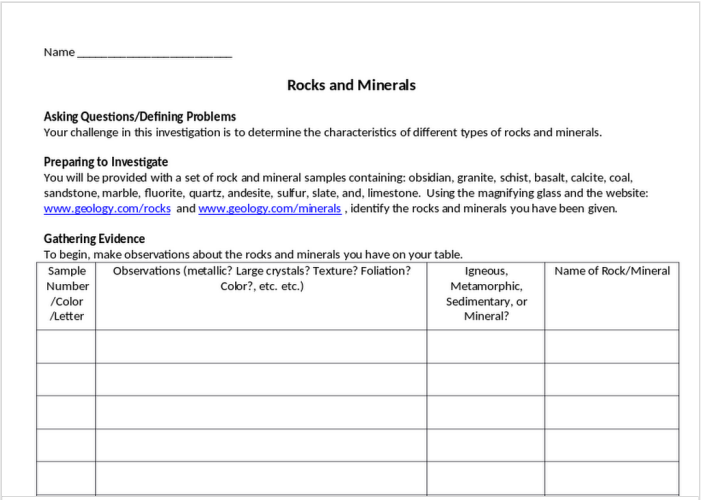
RANDI BRAZEAU DEC 01, 2018 11:38AM

Rock Lab - Word Doc



Name _____

Rocks and Minerals

Asking Questions/Defining Problems
Your challenge in this investigation is to determine the characteristics of different types of rocks and minerals.

Preparing to Investigate
You will be provided with a set of rock and mineral samples containing: obsidian, granite, schist, basalt, calcite, coal, sandstone, marble, fluorite, quartz, andesite, sulfur, slate, and, limestone. Using the magnifying glass and the website: www.geology.com/rocks and www.geology.com/minerals , identify the rocks and minerals you have been given.

Gathering Evidence
To begin, make observations about the rocks and minerals you have on your table.

Sample Number /Color /Letter	Observations (metallic? Large crystals? Texture? Foliation? Color?, etc. etc.)	Igneous, Metamorphic, Sedimentary, or Mineral?	Name of Rock/Mineral

Rocks_and_Minerals.docx
Word document
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Career Connections

WRENTWEET NOV 29, 2018 08:11AM

GLOBE International STEM Network Members (GISN)

The GLOBE International STEM Network (GISN) is an international network of STEM professionals (Science, Technology, Engineering, Mathematics) that work with GLOBE students around the world conducting science. STEM professionals mentor students and teachers, present scientific ideas, and/or collaborate on scientific research. Each relationship between a STEM professional and a GLOBE school is unique, and is determined by the STEM professional and the school.

Check Out The Website for Career Connections:
https://www.globe.gov/web/globe-international-stem-network/overview/gisn-members

WRENTWEET NOV 29, 2018 08:11AM

National Center for Atmospheric Research (NCAR)

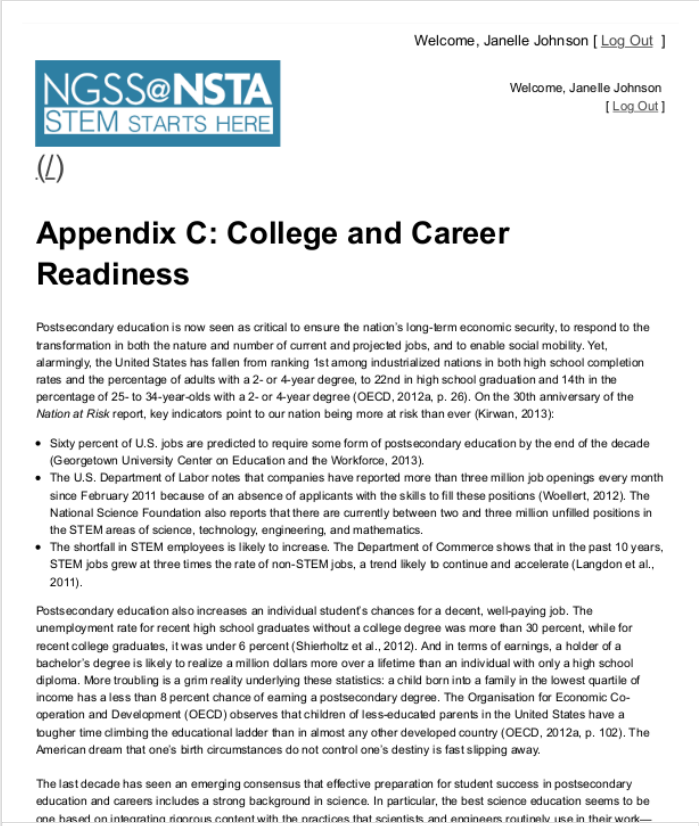
At NCAR, they don't forecast the weather. They get inside the weather, climate, and surrounding environment to understand it better. They study the Sun, air chemistry, how the atmosphere interacts with the land and oceans, and how we change and are changed by weather and climate.

Check Out Their Website:
https://www.youtube.com/watch?v=PVNDl29n8kI

JANELLE JOHNSON NOV 29, 2018 08:11AM

NGSS Appendix C

College & Career Readiness



Welcome, Janelle Johnson [Log Out]

NGSS@NSTA STEM STARTS HERE

Welcome, Janelle Johnson
[Log Out]

Appendix C: College and Career Readiness

Postsecondary education is now seen as critical to ensure the nation's long-term economic security, to respond to the transformation in both the nature and number of current and projected jobs, and to enable social mobility. Yet, alarmingly, the United States has fallen from ranking 1st among industrialized nations in both high school completion rates and the percentage of adults with a 2- or 4-year degree, to 22nd in high school graduation and 14th in the percentage of 25- to 34-year-olds with a 2- or 4-year degree (OECD, 2012a, p. 26). On the 30th anniversary of the *Nation at Risk* report, key indicators point to our nation being more at risk than ever (Kirwan, 2013):

- Sixty percent of U.S. jobs are predicted to require some form of postsecondary education by the end of the decade (Georgetown University Center on Education and the Workforce, 2013).
- The U.S. Department of Labor notes that companies have reported more than three million job openings every month since February 2011 because of an absence of applicants with the skills to fill these positions (Woellert, 2012). The National Science Foundation also reports that there are currently between two and three million unfilled positions in the STEM areas of science, technology, engineering, and mathematics.
- The shortfall in STEM employees is likely to increase. The Department of Commerce shows that in the past 10 years, STEM jobs grew at three times the rate of non-STEM jobs, a trend likely to continue and accelerate (Langdon et al., 2011).

Postsecondary education also increases an individual student's chances for a decent, well-paying job. The unemployment rate for recent high school graduates without a college degree was more than 30 percent, while for recent college graduates, it was under 6 percent (Shierholtz et al., 2012). And in terms of earnings, a holder of a bachelor's degree is likely to realize a million dollars more over a lifetime than an individual with only a high school diploma. More troubling is a grim reality underlying these statistics: a child born into a family in the lowest quartile of income has a less than 8 percent chance of earning a postsecondary degree. The Organisation for Economic Co-operation and Development (OECD) observes that children of less-educated parents in the United States have a tougher time climbing the educational ladder than in almost any other developed country (OECD, 2012a, p. 102). The American dream that one's birth circumstances do not control one's destiny is fast slipping away.

The last decade has seen an emerging consensus that effective preparation for student success in postsecondary education and careers includes a strong background in science. In particular, the best science education seems to be one based on integrating rigorous content with the practices that scientists and engineers routinely use in their work—

NGSS_appendix_C_college_and_career_readiness.pdf
PDF document
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Reflection: Application with Focal Students

JANELLE JOHNSON DEC 01, 2018 10:24AM

How can you apply today's content or approaches?

What would you need to modify for this to work with your focal students? How do you think they would respond?

6th grade is Earth and Space Science. I taught continental drift and Pangea last week, and my plan was rock cycle this up coming week. This session was very meaningful for my planning. I loved the idea of the rock testing and giving them hands on experience. As I've stated before, a lot of my kids have difficulty reading. Therefore, this hands on experience would be great for them to identify and highly engage them!
— TARA KIMMEY

Feedback & Evaluation

JANELLE JOHNSON NOV 29, 2018 08:11AM

What useful connections did you make during the workshop?

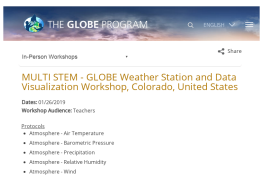
I loved the idea of the rock testing, while engaging them with hands on! I will use almost this entire session into my planning. I think it is imperative to not only give them background information with notes, but letting them discover proper names of rocks through testing. This will give them ownership of understanding and success when correctly identifying!
— TARA KIMMEY

JANELLE JOHNSON DEC 04, 2018 04:16PM

Upcoming sessions

Save the date!
January 26 at Auraria--Weather Stations with GLOBE
February 23 at Auraria
March 9 in Pueblo region
GLOBE Mosquito Training March 15
GLOBE IVSS & SRS--May 17 & 18th in Mescalero, NM
Discover STEM Career Expo-March 16
Two day summer institute June 5 & 6

In-Person Workshops - GLOBE.gov
GLOBE Training available across multiple Science Protocols around the world
GLOBE



JANELLE JOHNSON DEC 01, 2018 10:22AM

Evaluation

https://www.surveymonkey.com/r/MULTI-Dec-1-2018