1. What is our purpose?
   
1a) To inquire into the following:
   
- transdisciplinary theme HOW THE WORLD WORKS
  An inquiry into the natural world and its laws; the interaction between the natural world (physical and biological) and human societies; how humans use their understanding of scientific principles; the impact of scientific and technological advances on society and on the environment.

- central idea
  As the solid material forming the surface of the earth, rocks and minerals are everywhere and are used by people in a variety of ways.

1b) Summative assessment task(s):
   
What are the possible ways of assessing students’ understanding of the central idea? What evidence, including student-initiated actions, will we look for?

Foss Earth Materials End of Module Benchmark Assessments for Investigations (Mock Rocks; Scratch Test; Calcite Quest; Take it for Granite) and Summative Assessment

Group inquiry project: Students will choose to research a topic related to earth materials which addresses a key concept or related concept.

2. What do we want to learn?

What are the key concepts (form, function, causation, change, connection, perspective, responsibility, reflection) to be emphasized within this inquiry?

Key concepts: form, change, causation

Related concepts: categorization, evolution, resources

What lines of inquiry will define the scope of the inquiry into the central idea?

Inquiry into:

- Properties of rocks and minerals (form)
- Archaeology of fossils and human artifacts (change)
- Earth materials from different geographical areas (causation)

What teacher questions/provocations will drive these inquiries?

What kind of rocks do you see in your neighborhood or backyard? What is the difference between a rock and a mineral? What do we know about the past by studying rocks and formations? What are rocks used for in our and other cultures and economies today?

What are some of the properties we can use to describe individual rocks? How can we determine the ingredients of a rock?

What properties can we use to identify minerals?
Planning the inquiry

3. How might we know what we have learned?

*This column should be used in conjunction with “How best might we learn?”*

What are the possible ways of assessing students’ prior knowledge and skills? What evidence will we look for?

Formative assessments will include teacher observations, scoring of student sheets where students organize data during an investigation, and response sheets where students make observations and develop explanations, and performance assessments of students’ ability to plan, organize, and conduct investigations.

What are the possible ways of assessing student learning in the context of the lines of inquiry? What evidence will we look for?

- Students will gain firsthand experience with some of the most important rocks and minerals on Earth, discovering that rocks are made of combinations of minerals. Students use properties of minerals and rocks (color, hardness, chemical reactions) to identify and organize Earth materials and explore them as natural resources.
- Students will develop an interest in earth materials; gain experience with rocks and minerals; understand the process of taking apart and putting together to find out about materials.
- Students will use measuring tools to gather data about rocks; collect and organize the data; observe, describe, and record properties of minerals, and use scientific thinking processes to conduct investigations and build explanations.

4. How best might we learn?

What are the learning experiences suggested by the teacher and/or students to encourage the students to engage with the inquiries and address the driving questions?

Science Foss "Earth Materials"

Week 1: Foss Investigation 1
- **Mock Rocks:** Students will observe and describe the physical properties of mock rocks; using measuring tools to gather data about mock rocks; and record and compare observations about mock rocks.

Week 2: Foss Investigation 2
- **Scratch Test:** Students will explore the properties of a group of minerals; investigate the hardness of minerals; seriate minerals according to hardness; and use scientific thinking processes to conduct investigations and build explanations (observing, communicating, comparing, organizing)

Week 3: Foss Investigation 3
- **Calcite Quest:** Students will investigate four rocks to find out if they contain calcite; observe fizzing when the mineral calcite is put into vinegar; observe and compare the results of evaporation; and use observations and data to develop evidence to support conclusions.

Week 4: Foss Investigation 4
- **Take it for Granite:** Students will organize a set of samples by sorting rocks and minerals; analyze a granite sample to determine which minerals are present; communicate evidence of the minerals in granite; and choose, plan and conduct own investigation.

Week 5: Students will work on group inquiry project presentations.

Field Trip:
- Students will visit the Grainger Hall of Gems to investigate the world of gems
and how geologists classify them in addition to making their own observations about different colors, shapes, and textures. Students will visit Underground Adventure to investigate how life above ground connects to life below.

**ELA:**
- Students will read a variety of Foss Science Stories which include letters, postcards, expository and historical informational articles, and folktales.

**Writing:**
- Students will maintain a science notebook and record their observations.

**Math:**
- Students will work on math extension problems related to the earth materials investigations.

**Social Science**
- Students will examine the interaction of human beings and their physical environment—the use of land, building of cities, and ecosystem changes in selected locales and regions.

**PSPE (Personal, Social, PhysEd):**
- Second Step Learning

**MIRTL:**
- Make art book journal to record inquiry discoveries about rock and mineral cycle
- Master Works of Art: Andy Goldsworthy stone sculpture; Tibetan and Native American sand painting and mandalas; Japanese Zen Garden
- Students will make: Rock/Mineral scientific illustrations; paper crystal origami; rock tumbling & crystal growing; fossil mold & cast
- Students will explore all aspects of rock cycle through sculpture
- Students will closely observe and illustrate rocks and minerals using loupes and lenses
- Sing: Rock Cycle

**Spanish:**
- Geography: Latin American countries and capitals in the target language.
What opportunities will occur for transdisciplinary skills development and for the development of the attributes of the learner profile?

**Transdisciplinary Skills**

**Thinking skills**: (acquisition of knowledge, comprehension, application, analysis, evaluation)

**Self-management skills**: (fine motor skills, organization, time management)

**Research skills**: (formulating questions, observing, collecting data, recording data, organizing data, interpreting data)

**Learner Profile Attributes**:

**Inquirer**: Students develop their natural curiosity. They acquire the skills necessary to conduct inquiry and research and show independence in learning. They actively enjoy learning and this love of learning will be sustained throughout their lives.

**Knowledgeable**: Students explore concepts, ideas and issues that have local and global significance. In so doing, they acquire in-depth knowledge and develop understanding across a broad and balanced range of disciplines.

**Attitudes**: Appreciation, Curiosity

5. What resources need to be gathered?
What people, places, audio-visual materials, related literature, music, art, computer software, etc, will be available?

**Web Resources**:

http://www.mineralogy4kids.org/minerals-your-house

http://www.caveofthemounds.com/activities/just-for-kids

http://www.sciencekids.co.nz/geology.html

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https://www.khanacademy.org/partner-content/mit-k12/mit-k12-biology/v/rock-cycle

https://www.youtube.com/watch?v=hAMBkoLhTBY

https://www.learner.org/interactives/rockcycle/


[http://ratw.asu.edu/aboutrocks_whatarerocks.html](http://ratw.asu.edu/aboutrocks_whatarerocks.html)


[https://sites.google.com/a/pvlearners.net/chall/rocks-minerals](https://sites.google.com/a/pvlearners.net/chall/rocks-minerals)


Audio-Visual Materials:

**Literature:**

*Rocks in His Head* by Elizabeth Coomer

*Stone Fox* by John Reynolds Gardiner


**Informational text:**

“If Rocks Could Talk--Obsidian” article in ReadWorks

**Miscellaneous:**

Rock tumbling kit

How will the classroom environment, local environment, and/or the community be used to facilitate the inquiry?

A PYP bulletin board will display all the components of this unit including transdisciplinary theme, central idea, lines of inquiry, key concepts, transdisciplinary skills, highlighted
learner profile attributes and attitudes. Students will reference this board when writing reflections.

A place will be provided where students can nominate model classmates who exhibit “inquirer” and “knowledgeable” and explain why student was nominated.

An interactive bulletin board with a “NWSE (Need to Know, Wonder/Worrisome, Something to Share, Excited) poster and space for students to display work and share knowledge.

Reflecting on the inquiry
6. To what extent did we achieve our purpose?

Assess the outcome of the inquiry by providing evidence of students' understanding of the central idea. The reflections of all teachers involved in the planning and teaching of the inquiry should be included.

How you could improve on the assessment task(s) so that you would have a more accurate picture of each student’s understanding of the central idea.

What was the evidence that connections were made between the central idea and the transdisciplinary theme?

Kim: Groups inquired into caves, fossils, volcanoes, glaciers, rock cycle, earthquake, sand, and famous natural formations. These inquiries addressed the key concepts of form, change, and causation; however, did not address how people used rocks and minerals explicitly. When we developed the central idea, we considered how the transdisciplinary theme (How the World Works) specifically addresses an inquiry into the interaction between the physical world and human societies. However, our inquiry did not directly involve people. Rather it was only about the physical world and its laws. In our FOSS investigations, the inquiries centered around properties of rocks. I could improve the task by asking students how their topic affected humans (the “so what” aspect.)

In their unit reflections, students wrote the following: “To me it means that rocks are very important to people like calcite.” (Logan); “The world is changing.” Alyson; “The world is made of rocks and it helps the world.” (Jack); “It shows me how stuff is made of (earth materials) like food and buildings.” (Rohan)

Mack--: As the solid material forming the surface of the earth, rocks and minerals are everywhere and are used by people in a variety of ways **lets reword the CI**

Inquiry groups were formed from inquiry questions. The groups included Rocks in Space, How diamonds are formed, What do fossils tell us about the age of the earth, How are gems mined and how does that affect the earth? Plate tectonics. The variety of topics allowed for inquiry into the form and function of rocks and minerals as well as how they are used by people and how they affect us.

7. To what extent did we include the elements of the PYP?

What were the learning experiences that enabled students to:
- develop an understanding of the concepts identified in “What do we want to learn?”
- demonstrate the learning and application of particular transdisciplinary skills?
- develop particular attributes of the learner profile and/or attitudes?

In each case, explain your selection.

Kim: The concepts form, change and causation were understood through the FOSS investigations into what a rock and mineral was and how to identify them and how a rock is made up of minerals, how rocks change through the rock cycle, and how different minerals’ properties will dictate how they are found and used.

We focused on research skills in our group inquiries and self-management skills in our safe behaviors in the lab. We also used our thinking skills throughout the FOSS scientific investigations.

Students were very curious because the science investigations were hands-on and engaging. Appreciation was exhibited by the excitement students show in bringing in rocks and sharing what they learned during home investigations. Working in group inquiry projects and exhibiting their work during the Inquiry Fair developed their inquiry and knowledge, not only on what each individual researched, but collectively, through presenting their knowledge to each other.

We used Foss kits, movies and books in order to inquire into the properties of Rocks and Gems by testing rocks, learning about three different types of rocks and how they're formed, the effects of mining and how the rock cycle works.

Skills: Students used self-management skills when using the internet and working in inquiry fair groups. Students used research skills to answer their questions they developed. Students got together after school to work on their projects using time and organizational skills.

LP: Inquirers, knowledgeable. Students developed questions to answer during inquiry time. They increased their knowledge from working together, the field trip to see the Gem exhibit, reading books on their topics and viewing movies.

Attitudes: Curiosity, Appreciation. Students grew in appreciation of rock and minerals most as they applied to their lives. They researched the vitamins and minerals they take everyday as well as how it exists in their homes and other resources.

Students expressed interest and showed curiosity in gemstones for their beauty, they
enjoyed learning their birthstones. Discussions about why we’re so attracted to them could be included next time.
8. What student-initiated inquiries arose from the learning?

Record a range of student-initiated inquiries and student questions and highlight any that were incorporated into the teaching and learning.

Kim: Students created a concept map (see attached) with questions. The inquiries involved topics which the students wanted to investigate.

1. Are any planets made of diamonds?
2. Why are diamonds famous?
3. What kind of rocks are fossils in?
4. What happens to the earth when they mine for gems?
5. What are plate tectonics and what do they show us about what earth was like?
6. How do caves form?
7. What is a sinkhole?
8. What birthstone goes with what gem?

At this point teachers should go back to box 2 “What do we want to learn?” and highlight the teacher questions/provocations that were most effective in driving the inquiries.

What student-initiated actions arose from the learning?

Record student-initiated actions taken by individuals or groups showing their ability

Kim: Andrew, Charlotte, Sophia, and Peyton brought their special rocks from their rock collections and travels. Alyson brought me several rocks as a gift. Several students began rock collections or added to their rock collections. Many students did the extra-curricular, optional home connection activities provided by FOSS.

Students returned to the Gem exhibit at the Field Museum

One of my parents told me her daughter wants to be a geologist

A student brought in her rock collection

Students brought in books

A student asked to take home the movie we saw called Rock Odyssey. Her mom told me she watched it three times

9. Teacher notes

One of the read alouds was about being a Geologist. We could inquiry into this further into the careers related to this unit such as geologists and archeologists. We read some legends and could look into finding more. Having fiction mixed into this high non fiction unit was refreshing.

Next year, we will read about the “pet rock” phenomenon and make our own.

I would also like to do a close read on the lyrics to “I am a rock” by Simon and Garfunkel.

Possible new CI etc.

Central Idea:

The Earth is constantly changing and many factors contribute to that change.

Transdisciplinary Theme: How the world works

An Inquiry into:

- How the Earth has changed and continues to change through process such as erosion and the rock cycle.
- The various components of the Earth.
- How rocks and minerals are used in daily life.
- How the local landscape has changed.

We plan to rework the central idea and lines of inquiry to better incorporate the FOSS investigations.