Unit of Study: Inquiry into Rocks and Soil

Grade Level: First Grade (Jennifer Barnes) Date: Fall

Planning Units of Study: Center for Inquiry

Envisioning Possibilities: Planning on Paper

Our best planning comes from making predictions and creating conditions for students to engage in particular kinds of thinking (for example, strategies, skills, and content connections). When planning demonstrations or engagements, it is critical to ask ourselves what kind of thinking, conversations, and learning strategies we want to promote.

Bringing Plans to Life

Curriculum is the transaction occurring among teacher, students, and resources within and across curricular structures; such as morning meetings, reading, writing, and math workshops, and units of study in the social and physical sciences.

Responsive teaching is about identifying patterns in kidwatching data and planning responsively for individuals, small groups, and for whole-class instruction. From kidwatching to curriculum, from moment to moment, as well as planning ahead—the teacher designs minilessons deciding what or who to highlight during strategy sharing sessions.

Creating curriculum with and for children to help them think, work, and communicate as readers, writers, mathematicians, scientists, and social scientists by working within an apprenticeship model (working in front of, alongside, and behind students).

(Mills with CFI faculty, 2008)

Beliefs that Underpin this Inquiry

Children are naturally curious about the world around them. From their earliest memories, they have played with rocks, sand and dirt. Having created sand castles, tossing pebbles in ponds, carrying stones to their bedrooms, starting a rock collection—they have noticed interesting features before. Naming some of those properties might be new for them; but their prior experiences with soils enable them to be engaged throughout this study as confident young geologists.
Resources are widely available and easily accessed. Children were invited to collect soil samples from their travels during the summer. On the first day of school, we had an abundance of materials to explore and study. It took one close look for the children to realize that their home and mountain soils were vastly different from those collected in the bottles and baggies around them. After the soil square samples were glued and labeled, children began bringing other resources from home—rocks, gems, field guides, maps, and other nonfiction materials. Children and teachers worked together to provide resources for everyone’s benefit.

Using sophisticated terms enhances this study. As we confer with young petrologists about the origins of rocks or as we dig up fossilized chicken bones with paleontologists (or “dinosaur-study-ers” as young Martin describes), we raise the level of their learning. Continually new vocabulary is gleaned from our daily read-aloud nonfiction texts and added to our written and spoken work.

A variety of tools and instruments adds to the inquiry. Our tools may be simple—magnifiers, loupes, goggles, screens, vials, rulers. Yet, the children’s work with them is essential. They could have spent hours with the clear vials alone, shaking up the elements; comparing soils (both wet and dry) across several vials; noticing the stratified levels of silt, clay, soil settling in the mixtures. In creating the bones, simple toothbrushes, spoons, and craft sticks become paleontologists’ brushes, shovels, and picks.

Throughout our daily structures of writing workshop, reading workshop, read-alouds and math, this soil content spilled over. Our writing workshop books have become informational nonfiction. We realize we do not know enough dinosaurs (or birds or baby facts) that begin with all the letters of the alphabet. Therefore, we begin our quest for more information so we can, in turn, change others’ lives as much as these experiences have changed ours!

**Questions to Frame this Particular Inquiry**

- What is important for children to know and understand about soils and rocks?
- How can we best uncover the standards for earth materials?
- Which perspectives (geologist, paleontologist, petrologist, researcher, nonfiction writer, reader) offer potential insights for this inquiry?
- Which resources will impart the most relevant content?
- How might the water cycle help us understand earth materials more?
- How might “change over time” help us understand as we see how boulders break down and how the water cycle works?
- What accounts for the huge variety of differences from soil in varying locations?
- Which experiences will most engage our young learners—in a subject that might appear to be dry and boring?
- How can I immerse all learners, beyond those with rock collections?
- What difference do rocks and soils make in our lives?
- What beneficial products are made of rocks and soils?
Method(s) or Investigation(s) that will Promote Authentic Inquiry

How might students learn the skillfulness of inquiry? Given the questions posed, would observations, interviews, experiments, surveys, controlled studies or other methods best support this inquiry?

Open-ended templates—such as the Science Laboratory form—gave the children a structured place to sketch, notice, and name properties of rocks and soils. The open-ended framework is critical for students of all academic levels. A beginning scientist could write “bg” for big (in describing size) while more rigorous mathematicians could measure and chart the specimen in inches or centimeters. We store these Science Laboratory forms in the children’s three-ring binders so that, over time, we can assess how they have grown and changed as scientists, researchers, mathematicians, and writers.

Capitalize on independent and small-group work during a science workshop time. Gluing and labeling soil square samples, digging out fossilized chicken bones, and researching individual ideas for writing workshop books are all individual and small-group investigations. Having plenty of interesting options for all students to be engaged is essential as children and teachers work together, yet separately at times in this study. Some areas that became very important to our work: the trays full of rock specimens; many vials available to create mixtures as well as to explore classmates’ labeled samples; an abundance of interesting and relevant books; “Our Collection of Soil Samples” board with magnifying glasses nearby; and journals, sticky notes, and writing papers to document learning. Leave time at the end of the workshop daily to confer about experiences, share new learning, pose questions, collaborate, and make future plans.

Use available resources from the school. The activity of comparing and contrasting tuff, basalt, and scoria was gleaned from a FOSS kit. Having the materials readily available was a plus (since I personally had little knowledge of rocks and soils to begin with.)

Key Demonstrations and Engagements throughout this Inquiry

What are the primary teaching and learning strategies to be employed?

Collecting soil samples over the summer prior to first grade. This interactive homework gave us a jumpstart right into our curriculum. The children’s faces glowed as they shared baggies and bottles of soils from their homes, beaches, mountains, other states, grandparents’ houses, amusement parks, gardens, even churches. (Wouldn’t teachers be thrilled to have a pile of resources they did not have to scrape up themselves ready to use on the first day of school?) Although we could only glue a limited number of squares at a time, the atmosphere was rife with excitement.

Comparing and contrasting soils and rocks. We examined soils and rocks throughout the study—whether more informally chatting about the ones we like on a tray or formally noticing characteristics of three different rocks working with a small group. (In this FOSS kit experience, the children were asked to observe, compare, and contrast several rocks. They were further requested to think also about where this rock might have come from, what it would be useful for and what its name might be. As the groups later shared their
ideas, we created a class graph to document our noticings. They noticed that one rock “wrote” on paper. One seemed to turn black in water while another turned pale. One floated while another sank. One was rough; one, smooth. One was “hole-y” while others, normal. At the end of the experience and their reflections on the origins and purposes of these rocks, I told them where they actually were from; what they are currently used for; and the official classifications and names.)

Sketching. Mounting the sketches on black paper and displaying them (like a museum) brings a different aura to our inquiry.

Using earth materials to create stepping stones. We actually had created stepping stones as kindergartners. Each child had brought simple, yet meaningful items to push into the concrete along with the letters of their name. Therefore, we created a few new ones for the new first graders and teacher intern.

Undertaking a mini inquiry into dinosaurs and fossils. As children read and write, confer and question, many other topics emerge. The topic of fossils came up as they closely examined rocks and some of the variations in texture. As an alternate activity—and to give the “old” kindergartners another experience with working in the concrete, they sought to create fossil representations with shells, leaves and even favorite items from our classroom. And when fossils surface, dinosaurs will follow. Many children absolutely have a passion for dinosaurs.

Using chicken bones from our Thursday lunch to understand more how dinosaur bones were preserved over time. We pressed chicken bones into a tray of playground sand to make a solid impression. Then we poured plaster into the chicken leg “mold”. Several days later, we gently used the paleontologists’ tools to dig out the bones. As the dinosaur bones were being unearthed, I initially stressed because only a few remained whole. However, one child quickly reassured us that most dinosaur bones are not in one piece. “So, this is what the paleontologists really face!” In essence, we had designed a mini excavation site where our real paleontologists could authentically work.

Writing A to Z books. During our previous year in kindergarten, we had read prolifically from author Jerry Pallotta and his alphabet books. In fact, during several inquiries, we read one page a day from his texts to ground our studies. It was a natural fit for the children to equate alphabet studies with this new nonfiction topic.

Capitalizing on Sam’s passions expert project from kindergarten: “Rocks.” A major touchstone of our kindergarten year had been the children’s passions expert projects where they chose an interest, hobby, or passion of theirs to teach us. Children are experts at many things—and learn to become researchers, writers, and presenters. Year after year, I have seen children claim rocks, crystals, and gems as passions to share alongside bowling, caring for babies, snow globes, and high heels.

Generating a collaborative chart entitled “What do we make with rocks?” Children brainstormed everything from jewelry, sidewalks, and monuments, to bridges,
countertops, and tombstones. More ideas will surface as nonfiction books are read, home/school connections are returned, and experiences are shared.

Reading galore. Interesting nonfiction texts are some of the best teachers in my classroom. Look for texts with unique photographs, captions under pictures, labeled drawings, and interesting words. Definitely include books that might be considered “above grade level”—these can be read-alouds. Or the children can mark interesting pages with sticky notes for you to read sections that are engaging to them. If you happen to reread something the children have already learned, it gives them an opportunity to affirm that prior knowledge. Those repeated readings grounds the information even more in their brains.

Experiencing the water cycle. After putting rocks and soils in vials, Madeline wanted to see if we could change them. The children agreed to try to change some of the vials while leaving others plain. Water was their choice. They noticed that water enhanced some of the colors of some rocks; broke down other rock pieces; settled differently with different types of soils; turned the dirt into mud and more. We read about the water cycle and took that learning to heart as well. We celebrated with Mud Day—where we tried to make hand and foot prints (in dirt with and without water), watched how water flowed, moved mud in different ways to channel the flowing water and more.

### Envisioning a Possible Touchstone Experience

*Just as touchstone texts are accessed throughout units of study in reading and writing workshop and revisited over and over again to deepen and broaden learning, touchstone experiences are foundational to units of study in the sciences and social sciences. Field studies, visits to the pond, author studies, summer inquiry, science experiments, teaching/learning projects, genealogy projects and expert projects are a few examples of touchstone experiences. Given the key demonstrations and engagements planned, which one might best serve as a touchstone experience?*

Determining the touchstone text during this study has been difficult. We learned through so many unique experiences. Yet, the catalyst for all these experiences had to be the collection of soils that began the whole inquiry. Prior to the first day, the children had already begun collecting and observing soils. The collections board was continually accessed—and added to—throughout the year. As a matter of fact, this class decided to collect soils from each of our field studies. So, when we went to the downtown library, we scraped some dirt from the sidewalk there. The marionette theater, park, and the local experimental station garnered different soils.

The process we used to make the board was simple. The children first suggested titles. We voted for the one that best fit our interests and purpose. This class’ board was entitled “Our Collection of Soils.” Several children worked together to pour glue into a two-inch-square shape. They would carefully sprinkle their soil over the glue. While we waited for the glue to dry, they would write the on the self-adhesive label detailing the original location of the soil. We would gently clear the spot of any stray soil and attach the label. My goal was to complete five or six glued samples at a time. (Otherwise little elbows
would smudge wet squares or beach sand would be dripped onto mountain soil.) We would leave the glue to dry overnight and carefully shake it off in the morning. Looking at the board, you can clearly see it was done with the children. Many observations were made during those moments of waiting.

**Strategies, Skills, Content, and Concepts to be Addressed Through Demonstrations, Engagements and Touchstone Experiences**

*What standards will be uncovered through this inquiry?*

**Science Concepts** uncovered during this study were:

- demonstrating an understanding of scientific inquiry, including the processes, skills, and mathematical thinking necessary to conduct a simple scientific investigation through
  - comparing, classifying, and sequencing objects.
  - using tools safely, accurately, and appropriately.
  - carrying out simple scientific investigations.
  - using appropriate safety procedures when conducting investigations.
- explaining how distinct environments throughout the world support the life of different types of plants.
- demonstrating an understanding of the properties of Earth materials (Earth Science) through
  - recognizing the composition of Earth (including rocks, sand, soil, and water).
  - classifying rocks and sand by their physical appearance.
  - comparing soil samples by sorting them according to properties (including color, texture, and the capacity to nourish growing plants).
  - recognizing the observable properties of water (including the fact that it takes the shape of its container, flows downhill, and feels wet).
  - illustrating the locations of water on Earth by using drawings, maps, or models.
- exemplifying Earth materials that are used for building structures or for growing plants.

Some of the **common core language skills:**

- Informational Text readings: Understanding key details, making connections, knowing and using text features, using illustrations and details in a text.
- Foundational Skills: Understanding and using appropriate print concepts, phonological awareness, reading with sufficient accuracy and fluency to support comprehension.
- Writing: Creating informative explanatory texts in which students name topics, supply facts and close well, participate in shared research and writing projects.
- Speaking and Listening: Participating in collaborative conversations with diverse partners with peers and adults in small and larger groups, building on others’ talk in conversations by responding to the comments of others through multiple exchanges, asking questions for a variety of purposes.
UNIT 5: Rocks and Soil, Grade 1

- Vocabulary Acquisition and Use: Extending knowledge of new words and accurately using them in proper contexts.

**Strategies for Reflecting on and Documenting Learning**

*How might we demonstrate growth and change? What are our new questions?*

Anecdotal records and kidwatching notes are easily taken throughout this study during the many small group invitations and the culminating closure of Science Workshop each day. Inquiry was clear as the children thrived in working with these earth materials and collaborating with those around them.

Each morning, children checked the soil samples board to talk about how the new dirt compared with the previous ones. One prim little girl, Ashli, would visit the soils daily. She preferred not to play in dirt on the playground because she did not like getting sand in her shoes. But, she loved this board. She would run her fingers across the textures of the beach sand with seashells attached and the hard clay of her yard. She wondered why Charleston sand was different from that of Myrtle Beach or even of Hawaii. She postulated on the difference in Mills’ soils in his front and back yards. Having the soils all attached—and not dropping loose in her shoes, she truly generated a number of insightful comments and questions, ones we continually brought to the large group during our sharing times.

We continued to refer to the soil collection display throughout the year. Overheard often were children comparing “my dirt” to “your dirt.” The children surely took great ownership and choice in this study. Perhaps there are continued ways we can capitalize on that ownership.

Interestingly, during the second year’s experience of creating stepping stones, one child looked back and forth from the old and the new stepping stones and remarked, “I didn’t know we used dirts to make those!” Isn’t it amazing how reflection on this child’s part enabled all of us to take our prior experiences and think about them in light of our new learning?

**Reflexivity: Studying Ourselves and the Implementation of this Unit of Study to Grow and to Change**

*How did it go? What do we want to hold onto? What do we want to revise?*

Integration during writing workshop is definitely something to continue. The quality readings enabled the children to unearth many new science terms which they, in turn, began using in their speaking and writing vocabulary. Their desire to create an extensive nonfiction text on the topic of their choice truly gave them incentives to become more adept researchers, even at such young ages. They even began attempting those interesting elements of print they noticed in the nonfiction books: use of parentheses and dashes to assist in proper pronunciations, labeling in drawings, and more.
UNIT 5: Rocks and Soil, Grade 1

One experience I wish to try in the future is using earth materials from around the school and community (not concrete from the store) to create our own bricks. I believe it will give us a unique understanding of how people lived long ago (which should enhance our social studies and future grandparent expert projects.)

This particular year, the children began wondering about soils and how they impacted plant growth immediately. So, it made sense for us to create some experiments with plants and varying types of soil. Being a responsive teacher enabled me to follow the lead of the children.

That same responsiveness as a teacher enables future classes to take their learning in different directions. Another year, our budding paleontologists went exploring at a site to simulate an archaeological dig. (I had previously hidden very realistic-looking puzzle pieces from a large dinosaur skeleton puzzle under dirt and pine straw near our playground.) The children took the experience seriously as they used small shovels and brushes to unearth the bones. They marked the location of the bone and cooperatively worked together to see if they could “make the bones go together.” (We never called it a puzzle; the young paleontologists always referred to it as the dinosaur bones!)

In subsequent years, it was a smooth transition from rocks and soil to delve into architecture. We read books on various homes both local and around the world, learned an architectural term for each letter of the alphabet during our A to Z architecture study and handwriting books, sketched elements in architecture, searched online for detailed photos and variations, explored Google Earth to locate famous architecture and created a scavenger hunt of our city culminating the experience.

Data Sources (primary and secondary) to Support this Inquiry:
Envisioning Text Sets with Books, Videos, and Artifacts and Possible Collaborations with Related Arts and Technology


Many books by Jerry Pallotta were accessed prior to and during this inquiry, including:

Possible Guiding Questions for Planning

**Conceptual**
- **Perspectives:** Which perspectives (reader, writer, mathematician, scientist, and/or social scientist) offer potential insights or strategies for investigating this unit of study, i.e., What questions would a social scientist ask and how might she investigate this issue? What questions would a mathematician ask about this topic?
- **Systems:** What systems are involved in this unit and how are they related?
- **Cycles:** Are there cycles embedded in this unit of study? How might we gain a deeper understanding of the unit by investigating the natural and man-made cycles?
- **Change:** Has change occurred over time in relation to this unit of study? If so, how might studying the natural or man-made changes help us better understand the topic?
- **Voice:** Whose voice is heard or privileged? Whose voice is absent or silenced?
- **Power:** How might power structures help us better understand this issue?

**Pragmatic/Universal**
- **Who** developed the idea, invention, or concept?
- **Why** was the idea or invention created? What was the purpose of the invention give the context and culture of the time period?
- **Where** did the knowledge or invention presented in the materials we are reading in this unit of study come from? Can we trust or believe it? Do we need to access multiple sources to triangulate our knowledge or understanding?
- **Have** common knowledge, beliefs, or understandings about this topic changed over time? What led to shifts in our beliefs or understandings?

**Personal Knowledge**
- **Why** does this knowledge or information matter to me?
- **How** has what I have learned during this unit changed me?

**Social Knowledge**
- **Why** does the knowledge I’m learning in this unit of study matter in the world?

**From Personal Knowledge to Social Action**
- **So what?**
- **Now what?** How might we take action on what we have learned during this unit of study?
- **How** might we show or demonstrate what we have learned during this unit to others?

(Mills 2013)