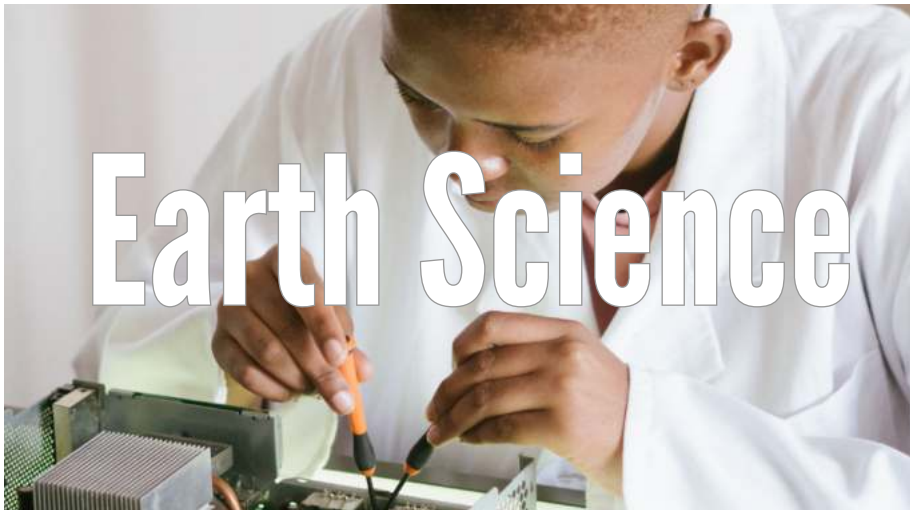
Your Natural Learner

Fourth Grade Curriculum

A Child-Led, Natural Learning Curriculum

by Leah McDermott, M.Ed. © 2022



INTRODUCTION

Your Natural Learner Fourth Grade - Earth Science Theme

In this theme, your child will explore the study of Earth Science, which is the branch of science dealing with the physical makeup of the Earth and its atmosphere.

This theme will take your child on a journey through the Earth, exploring things like erosion, geology, landforms, and more!

Sub-Sciences of Earth Science

1. Geology
2. Meteorology
3. Astronomy*
4. Oceanography*
5. Environmental Science*

**also studied in a separate theme this year*

Subject Area Guide

Look for these symbols on each activity page to let you know which subject areas your child will be learning about while doing the activity!

 = Literacy

 = History

 = Math

 = Art and Expression

 = Science

 = Technology

START HERE:

Earth Science Intro Lab - Soil ID Sediment Jar

A great way for your child to begin their exploration into Earth Science is to explore what the earth looks like right outside their door. This activity gives them the opportunity to find out what the makeup of the soil is like at your home. To do this activity you need a glass jar and a spoon or shovel. Have your child go to any space in your yard and fill the jar halfway with soil. Fill the rest of the jar with water leaving about an inch at the top. Attach the lid and shake vigorously to blend all of the dirt into the water and break up any clumps of soil. Now set the jar aside to rest - ideally overnight to allow all of the sediment to settle completely. After about 24 hours of settling, the soil will separate into three distinct layers: sand, silt, and clay. Sand will be at the bottom, silt will be in the center, and clay will settle at the top. By examining the makeup of the soil sample, your child can determine what mixture of soil you have in your yard. This is especially helpful for knowing what you might need to do to alter the soil based on what you're going to plant or attempt to grow in this area. For example, if your soil sample is primarily sand and you're trying to grow something that needs clay-heavy soil, you'll need to make those adjustments. Have a conversation with your child about what they notice in that sample. Note to them that for an ideal soil mixture for gardening or growing, you want all three layers to be roughly equal.

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Use this table of contents to quickly find the activity or section that you're searching for.

If you are viewing this digitally, you can click the activity or section and it will take you directly there!

WHAT YOU'LL LEARN

This information will help you get a clearer, overall picture of the learning concepts that will be covered in this Earth Science theme. This is especially helpful if you have to track specific concepts for assessment and progress with your state regulations. Please note that the concepts listed here are academic-focused, and are NOT the most important things that you should focus on as your child learns and grows throughout this year of exploration. Physical development, emotional growth, social connections with others, communication skills, etc. are all priorities in natural, lifelong learning!

Overall, in this Science-focused theme, your child will be exploring the realm of Earth Science: rock exploration, erosion, deposition, changes to the Earth that are both man-made and natural and their effects on human and animal life, landforms, geography, the water cycle, and more! This is such a big and wide-reaching area of Science that there is so much space and opportunity for your child to continue their explorations long after the activities have finished. You will explore these ideas more with your child in the Final Analysis.

Specifically, you will find the following skills presented and covered in this theme:

Subject Area	Skills Covered in This Theme
Mathematics	advanced number sense, place value, factors and multiples to 100, prime vs composite numbers, analyzing/generating patterns
Science	geology and rock exploration/identification, erosion and deposition, ground water effects, landforms, water cycle, soil investigations
Art/Creativity	Earth topography explorations, working with new mediums, layers of the Earth representations, nature as art
Literacy	non-fiction journaling, punctuation, writing introductions with good hooks, descriptive non-fiction writing, comparisons
History	Earth Science pioneer study, fossils, tree ring/core samples, study of the globe
Technology/Other	connection of text with visual/audio presentations, digital exploration

What is the Math Focus in the "Earth Science" Theme?

The primary focus in the math section of this theme is recognizing and playing around with patterns. The science of mathematics is rooted and grounded in patterns - it's through recognition of patterns in nature, numbers, and life itself that mathematicians have developed entire theories and principles. Giving your child the opportunity to explore and engage with patterns helps them develop not only practical math skills like advanced number sense, but it also affords them the opportunity to recognize things that would otherwise be far beyond their age-based scope of understanding. Beyond pattern exploration, your child will play several math games to help them engage with math skills in a fun and hands-on way, and practice with factors, place value, and multiples.

How Do I Use These Activities?

Most of the activities in this section are math games, which can be played over and over again. In fact, the more your child comes back to these games, the deeper their understanding of the concepts and the more meaningful their practice will become. As you prepare for conducting these activities in this theme, allow time for your child to play and explore these math games/activities multiple times throughout the course of the Earth Science theme (and beyond!).

How Do I Know My Child Is Learning?

Remember that it is very important to meet your child where they are, especially with math concepts. If any of the math skills required in this theme are new or challenging to your child, don't see that as a defeat or a reason to skip the activity. Instead, offer as many supports to your child as are necessary - internet searching, calculator, etc. Through using these tools to build their confidence, they are simultaneously building their stores of knowledge and comprehension!

Playdough Core Sampling

Key Learning: Your child will get a chance to explore their math skills and their understanding of the geological structures of the Earth in this super fun, hands-on activity!

Need: small plastic container, playdough in four different colors (ideally blue, red, yellow, and green), plastic straw, paper, pencil, colored pencils matching the playdough colors

Directions: *Note: Generally we encourage as little waste as possible, but for this specific experiment, we've found that using reusable straws just don't work as well. Keep this in mind when you are preparing for this activity.*

First, explain to your child that they are going to be making a playdough example of a piece of land, and conducting some core sampling experiments to learn more about it.

Have your child draw the shape of their container on their paper to start (circle, square, etc.). Now, using the four playdough colors, determine what types of earth each color will represent. You'll need to represent water, topsoil, hard rock, and clay. Have your child make these choices and draw a color key with the colored pencils on their paper as well.

Now, it's time to construct the land by placing the playdough into the container. Consider that hardrock would make up the majority of the foundation, spread out some clay and water in various spots, and cover with topsoil in various thicknesses. This can be done by your child or by you, in secret, so that your child is unaware of what is under the topsoil.

Once the playdough land is constructed, it's time to take some core samples and make notes on your paper! Have your child choose a spot on the property and stick their straw straight down to the bottom of the container. Pull the straw out and gently squeeze above the playdough to squish it out of the straw. You should see clear layers of the playdough in the sample! Your child should draw this sample with the matching colored pencils on the coordinating spot of the plot of land that they drew on their paper.

Repeat the core sampling in several places around the plot, drawing what is found at each spot.

Discuss with your child as they are sampling what they notice. Is there water showing up on certain parts of the land, but not others? Is the topsoil deeper in some areas? Where is there clay/soft earth in abundance versus a stronger hardrock foundation? What assumptions can they make about this property based on their core samples?

Continue this exploration until your child feels that they have a good understanding of the property.

Extension idea: Invite your child to decide how they would build on this piece of property based on what they learned. Where would be the best place for a house? A garden? A garage? A well? Have them draw out their ideas on the paper plot!

SCIENCE EXPERIMENTS

What is the Science Focus in the "Earth Science" Theme?

In this theme, your child will explore a variety of ways in which the Earth changes over time, focusing specifically on transformations through weathering, erosion, growth of crystals, and the formation of various landforms. Your child will also begin the basis of some lab experiments through the setting up and conducting of a Rock Lab, where they can experiment and explore and observe with their own rock collection. This will help them to practice identification and note taking in their scientific journey.

How Do I Use These Activities?

You'll want to space these activities out throughout the duration of the Earth Science theme, as most of them require your child to come back and explore for several days or more at a time. You want to make sure that you leave enough time during your Earth Science journey that they can actually conduct each of these experiments thoroughly, while leaving space between the science experiments for all of the other activities throughout this theme. Follow any notes or guidelines in each activity that might direct you towards a logical sequence or matching up with other activities from the theme for the most effective planning strategy.

How Do I Know My Child Is Learning?

Since most of the science experiments in this theme are looking at a change or transformation, focus primarily on discussion and the notes that your child is taking in their science journal to assess their understanding of the transformations that they are witnessing. Keep in mind that with most of these experiments, it's not about a conclusion or the end result of the experiment. Most of the learning happens in the path through the experiment.

Erosion Effect on Ground Water

Key Learning: This experiment, which takes place over a few days, will give your child a hands-on opportunity to see the effects of erosion on ground water under different circumstances. Specifically, your child will be able to see that when keeping trees and green spaces is made a priority, the ground water is cleaner and safer for environment and the local habitats.

Need: three empty plastic gallon jugs with lids (vinegar containers work perfectly for this), three one liter soda bottles with lids, razor/scissors to cut plastic, hole punch, string, soil, leaves/garden debris, grass seed, water

Directions: *Note: This experiment will take several days (up to a week or more) to conduct due to needing to sprout grass seeds and giving time to observe the runoff of water through the containers. Keep this in mind when planning this experiment.*

Begin with a discussion about erosion and ground water to make sure your child knows what each of those things are. Explain that you're going to conduct an experiment that looks at different types of ground and how the water runoff is affected by erosion of the materials in each of the containers you'll set up.

Set up the three containers to represent different types of ground examples:

1. Dirt only

2. Dirt with leaves/dead matter

3. Green space

To build the containers, lay the jug on its side with the handle facing up. Cut the top 1/3 off LEAVING THE LID, so that you've removed the handle and top, but leave enough space to fill the jug with material, with the lid intact. Cut a 1/2" hole in the bottom half of the lid to allow runoff to drip through (Note: do NOT cut a hole in the grass one yet - you'll be watering the seed and don't want to lose that moisture.

Find a spot for the containers to sit still for several days, ideally in a spot that receives some sunlight during the day to aid in growth of the grass. Fill the containers up to about halfway past the lid space, according to the categories above - one with just soil, one with soil covered in dead, crushed leaves and garden matter, and one with soil and matter, and plant grass seed. Water the seed as needed. ***Wait for the grass to grow to at least an inch before continuing the experiment.***

When the grass has rooted and grown at least 1", cut the hole in that lid, and then create containers to catch the runoff. To do this, cut the bottom half off of each soda bottle, leaving lids attached. Punch a hole on each side of the halved bottle and tie string in a handle to the holes. Hang the bottles off the lids of the container, so that water will run through the hole you created, leaving runoff behind to examine. You'll need to push the containers to the edge of a counter/table to allow the bottles to hang.

Now, using a watering can, "rain" water over the containers for several days in a row. Each day, observe the water color that is collected. What do you notice? Which container does a better job at filtering the water? What can you concur about the makeup of the materials and their ability to clean ground water?

Extension Idea: This experiment is based off of water running over different types of earth - soil, dead matter, grass/trees, etc. Of course, in most of our communities, we are seeing an abundance of paving over earth to expand housing, infrastructure, etc. This is important to pay attention to in regards to ground water as well. Open a discussion with your child about the types of materials that could build up on concrete and roadways and how that might affect groundwater that isn't being filtered like their experiment above (examples: oil/gas from vehicles, paints, cleaning chemicals, etc.).

CREATIVE EXPRESSIONS

What is the Creative Focus in the "Earth Science" Theme?

In this theme, your child will extend their knowledge of Earth Science topics to create artistic displays of what they have learned. Through the Layers of the Earth Bowl and the 3-D Salt Dough Topographic Map, your child will put their understanding of Earth Science knowledge into their creations. The best part about these activities is that while they will test and challenge your child's knowledge, they also leave a lot of room for creative interpretation and exploration - making every decision your child makes one that is thought-provoking and valuable. In the final creative project, your child will step back to a simpler time in their lives and rediscover the joy of rock collecting (or, for the special few children who still love this pastime, perhaps this will enhance their love for collecting special rocks!).

How Do I Use These Activities?

Two of these projects are process-driven art, so keep this in mind when you are planning - you will need several days for layers to dry and for your child to work. The 3-D Map project is especially time-consuming, depending on how much creative expression your child wants to put into it. It is also a project that will utilize a lot of your child's Earth Science knowledge, so this is a great project to complete near the end of your learning journey through this theme.

How Do I Know My Child Is Learning?

These projects give you a special opportunity to assess your child's understanding through their creative expressions. Look for the unique ways your child represents what they know about landforms and mapping through the ways that they design and paint their map, for example. Assessing this way is so much more in depth that a worksheet or paper test!

Layers of the Earth Bowl

Key Learning: This activity is a twist on a papier mache project designed to look like the inside layers of the Earth. This makes a wonderful keepsake from the Earth Science theme, or a fun gift or something to share with a friend or family member to showcase what your child is learning about

Need: flour, water, recycled newspaper, large mixing bowl, whisk, saran wrap, a bowl (for a mold), acrylic paints, paint brush, image of the layers of the Earth to copy for painting (find this easily online)

Directions: *Note: this bowl will be decorative only - it is not to be used for food consumption and cannot be submerged in water to be washed.*

First, you will need to make some papier mache paste. You can buy this pre-made, but it's a simple concoction to make at home! To make your paste, you will mix one cup of flour and two cups of water. Whisk it very well so that there's as few lumps as possible. Microwave the mixture for 30 seconds and then stir and continue microwaving in 30 second intervals (mixing between each interval) until the paste just begins to thicken (You don't want it to be too thick - just to the not-runny stage).

Once you have your paste, you will create your bowl mold. Take the bowl that you are using as a mold, flip it upside down on a tray, and cover it well with several layers of saran wrap. This will ensure that you can remove your papier mache bowl once it's dried.

Cut the newspaper into strips about 1-2" thick. Then dip your paper strips into the papier mache paste, squeegee some of it off, making sure the paper is still moist, but not soggy, and drape it over the mold of your bowl, leaving at least an inch or two of overhang on each side as the papier mache will shrink as it dries. Do this to cover the entire surface area of the bowl in various directions to make it nice and strong.

Let it dry for several hours, and then repeat, adding another layer of paper to strengthen the bowl. Ideally, do three layers. Once the layers are all added and fully dry, remove the bowl from the mold and trim the edges. If the edges are rough, you can use a low-grit sandpaper to smooth them out.

Finally, paint your bowl! You can allow this to be open-ended for your child to do as they wish. A suggestion would be to paint the outside of the bowl to look like the Earth's surface (continents and water), and the inside to match the layers of the Earth. Labels of the layers can be added after the paint has dried with fine-tipped permanent marker.

Preserve the bowl with coats of mod podge or sealant if desired.

Extension idea: These make wonderful gifts for friends and family members! If your child enjoyed this project, invite them to make several to give to others in celebration of their Earth Science knowledge.

LITERACY EXPLORATION

What is the Literacy Focus in the "Earth Science" Theme?

In the literacy section of this theme, your child will practice their descriptive writing skills through a variety of activities that invite your child to use details to tell a narrative or description of what they've learned about the Earth. You will also work together to investigate the different ways that various authors use strategies to hook their readers, catching their attention from the very first line. In addition to building their expository writing skills, your child will practice building their knowledge of punctuation marks through some fun game play and solving mysteries of missing punctuation marks.

How Do I Use These Activities?

All of these activities can stand individually, so you can evenly space them out throughout your exploration of the Earth Science theme. Keep in mind that some of the more game-style activities might be really enjoyed by your child and will want to be played over and over again. Plan in space for that to happen, possibly planning the first use of them early in the theme. The Earth Changes Descriptive Writing activity relies on your child having some knowledge of the changes the Earth goes through, so this might be best worked on later in the theme.

How Do I Know My Child Is Learning?

Most of the skills practiced in this theme are ones that your child should already have a good foundation of, especially if they have used previous levels of *Your Natural Learner* Curriculum. This gives you a good opportunity to see what they remember from previous learning activities, and to help them build on that knowledge as they add new concepts and practice to their experiences.

Punctuation Mystery

Key Learning: By this age, your child should have a pretty good grasp of how all of the punctuation marks work and what they do in writing. This activity gives your child a chance to hone their punctuation skills as they see what writing would be like without punctuation, and then solve the mystery of which marks belong where.

Need: post-it notes, pen, scissors, children's book with a good variety of punctuation marks

Directions: *Note: Any book will work for this activity - ideally find a children's book with few lines on each page that contains a good variety of all punctuation marks. Also note that you do need to prepare the book in advance of the activity with your child - keep that in mind when planning.*

To prepare for this activity, go through your chosen book and cover all of the punctuation marks in the book with cut-down pieces of post-it note. Your child should still be able to see all of the words in the text, but no punctuation.

First, have your child read the text as if there is no punctuation. Explain that they should read it as it is written - since all of the punctuation is covered, they should read it without the inflection that punctuation would indicate. How does this make the story sound? Is it confusing? Is it hard to read or understand with no punctuation?

Next, have your child use the pen and go through the story, writing what punctuation marks they think belongs in each spot on top of the post-it pieces. No peeking underneath!

Now, go through the story again, reading each sentence as it is now punctuated. Remove the post-its and compare your child's additions to the author's choices. Do they match? If not, do both marks work? How does the way your child punctuated it change the sentence or the inflection? Would both options work or is there an obvious right/wrong? Lean into the opportunity for discussion and creative license here to explore what your child is thinking and how they are interpreting the story.

Extension idea: Have your child write a short story that has no punctuation in it. Try to read the story together - is it hard to understand or make sense of? Was it hard to write without thinking of punctuation? Discuss how punctuation helps both writers and readers make sense of their thoughts!

HISTORY CONNECTIONS

What is the History Connections Focus in the "Earth Science" Theme?

In this theme, your child will meet Inge Lehmann, a female pioneer in the study of the Earth - she discovered that the Earth has an inner and outer core through investigating seismic waves! Your child will practice their geography skills as they make a globe out of a balloon and challenge their knowledge of various geographical features. To dive into history, your child will hop all around the timeline of Earth as they investigate and make different types of fossils, analyze the life history of a tree, and create a visual timeline of the history of the Earth.

How Do I Use These Activities?

Each of the activities in this section give your child a chance to take knowledge that they likely already had and build upon it with new vocabulary, new information, and new ways of expressing how they know something. Space out these activities throughout the theme - none of them build upon another activity, but all rely on your child having previously explored the basic concepts before (super easy if your child has used a YNL Curriculum before). All of the activities are very open-ended from a creative standpoint, so depending on how involved your child wants to be with their work, be flexible with your planning to allow them to be able to extend their work as long as needed to finish.

How Do I Know My Child Is Learning?

As mentioned above, all of these activities will take a concept that your child already has a foundational knowledge of and build upon it with new information. Staying curious and allowing your child to take the reins and show you what they know in creative ways will help you determine how much new knowledge they are adding to their baseline.

Tree Ring Core Sample

Key Learning: Your child may know that you can count a tree's rings to find out how old it is, but this activity will help your child see how much more information you can find out (and imagine!) about a tree when you can look at its rings. This activity will give your child a chance to do some research, practice their narrative skills, and learn more about how to learn more from planet Earth.

Need: plastic straw, permanent marker, journal/paper and pencil, internet access (optional for research)

Directions: Start with a discussion about tree rings and what they tell us. We know that from analyzing tree rings in a tree's core, we can determine how old the tree is, and often we can learn about the conditions the tree grew in by looking at gaps in the rings. If there are large gaps in the rings, that represents a good growing year for the tree; small gaps would mean the tree grew little in that year, so likely there were less than favorable conditions or significant weather events.

Of course, for most of us, the only way to be able to count a tree's rings is for the tree to be cut down, exposing the core. In the scientific world, arborists and climate scientists can use a boring tool to extract a thin sample of the tree, through its core, to analyze the rings without damaging the tree significantly.

These tools are quite expensive and hard to come by for the novice tree scientist, so for this activity, your child will create their own tree core sample and do some investigative skill work to analyze (and imagine) what the rings show.

Make your tree core sample by drawing random lines across the length of one side of the straw with the permanent marker. Draw as many as you like, as far apart or close together as you like, imagining that one end is the center of the tree core and the other end is the outside edge near the bark. Your pretend core might look something like this real example of a tree core sample:

Now it's time to analyze what these rings are telling you about your imaginary tree! Begin by counting the lines - how old is your tree? (Remember - one ring equals one full year/growing season). In your journal, write notes about your tree. What year was the tree planted? What significant events have taken place in your tree's life? If your child is more into fiction writing, they can write a narrative about the life of that tree! Next, look at the gaps in the tree's rings. Were there any really good growing years for that tree? Were there any periods where the tree grew very little each year? Why could that have been? Perhaps a drought or really harsh, long winters? Get creative and imaginative as you design a narrative for your tree!

Extension idea: Extend your knowledge by finding a real tree to analyze the rings of! Take a hike or walk and find a tree stump. Or, better yet, seek out a local arborist or environmental division that might have the tools to pull a tree sample and can provide your child with some hands-on experience!

Rock Identifier App

Type of Resource: App

Where to find it: Apple app store - currently only available on Apple platform for any Apple device (a suitable Android alternative is an app called Geology Toolkit)

Description: If you've ever experienced the joy of having a plant identification app tell you what you're looking at, get ready to be even more excited when this app identifies your rocks and minerals collection!

Using a photo scanner, the app will analyze your rock and give you a great amount of details about it that will surely be of value to your child as they work through the Earth Science theme and spend quite a bit of time with rocks through various explorations. It also gives you tips on where to find different rocks/minerals in nature and some identification tips to help you learn what you're looking at too. You can also keep a digital collection of your rocks in the app.

Cost: The app is free to download and use up to a certain limit, there is a premium subscription option if you find you'll use the app frequently

Application: This is a great app to have on hand if your child (or you!) often find yourself trying to identify a rock or crystal. It will be especially useful during the Rock Scratch Test/Rock Lab activity in the Science section of this theme.

FINAL ANALYSIS

Earth Science Joke:

What did the limestone say to the geologist?

Don't take me for granite!

Once you've made it to the end of the Earth Science theme, take some time to invite your child to journal about their experiences throughout this theme. Use the following prompts as guidelines for your child's response, but allow them the freedom to answer the ones they feel they are best able to respond to.

Summary of Earth Science

Favorite thing you learned

Things you learned that you didn't really care about

Cool new fact that you discovered that you will enjoy telling others about

Something you want to share

Favorite subgenre of Earth Science

What do you want to learn more about in Earth Science?

At the end of the Fourth Grade year, your child will work through the Research Project theme where they will conduct their own scientific experiment. As your child reflects about their time spent studying Earth Science, ask them to write down any potential research ideas or science experiments they may want to do, related to Earth Science, when that time comes. It helps to write these ideas out while they're fresh at the end of each theme versus trying to come up with an idea out of nowhere when the time comes!