

Volcanoes and Early Childhood Education

Elizabeth Ortiz
Anderson Elementary School

INTRODUCTION

I was raised and educated in my native country of Colombia. Colombia is a country with a beautiful geological environment that attracts many tourists to these eye-catching sights. I have also traveled to Hawaii, Australia and New Zealand, where I was able to see some of earth's best geological sights. My interest in geological phenomena was awakened because during those trips, I could compare and contrast situations in my country versus the countries I visited.

In my pre-college education, I was taught that many different geologic phenomena played a major role in the formation of the Earth, as we know it now. So, what would be the influence of volcanoes on earth formations? How are they formed? These questions have many answers that are taught to older students and not to students in early childhood. For this reason, I have decided to create a unit that will address the needs of the current well-informed and inquisitive minds that we get in early childhood education.

We live in an era driven by technology. Our student population often comes to us with a mind that is not compatible with the traditional educational setting. In many ways today's students are far advanced, compared to students in the 60's and 70's. Yet, as educators, we continue to teach the basic three "R's" without considering the needs and abilities of these technologically advanced students. I have numerous students that can carry on a conversation pertaining to interesting topics. They know and understand more than what we expect of them. I see myself teaching and challenging my students in a manner that goes beyond the traditional early childhood curriculum.

Most people see early childhood as the basis for teaching social skills and other basic TEKS skills (colors, days, numbers, letter sounds, basic words, geometric figures, etc...). I have taught this curriculum for the past three years but at the same time I have challenged my students with numerous activities and projects. I know that I can create a volcano unit that will generate considerable interest among early childhood students. This unit would involve different activities that incorporate TEKS and Project Clear objectives. The student will be taught basic letters, sounds, vocabulary words, drawings, instructions, and hands-on activities that will culminate in the final project of the creation of an active volcano model.

Kids at this age, between 3 and 5 years old are very curious, so they already have numerous questions that they want to be answered. With the volcanoes unit we can answer some of these questions. What is a volcano? , Where do the volcanoes come from? What does the volcano look like from inside? What is the volcano composition? Is a volcano cold? Is a volcano hot? Where are the volcanoes located and why? How can we protect people who live near active volcanoes?

UNIT BACKGROUND

Our earth is the result of numerous geological events that combined to create the Earth, as we know it today. Volcanoes are still active today, and our students have the technology that allows them to see how they are formed. Unfortunately, this subject matter is not taught to early childhood students. The traditional early childhood curriculum is sufficient to meet the basic

needs of these students. Yet, I feel that they are not being challenged. Therefore, I want to be able to meet their other needs. Specifically, I want to challenge their inquisitive minds. The volcano unit will provide the students with various basic hands on activities that will allow them to obtain a better understanding of their geological environment. The end result is a student that is knowledgeable, tolerant, and sensitive to the environment in which they live.

A volcanoes thematic unit could be taught during four weeks, where we can connect different subjects such as physical education, mathematics, language arts, social studies, science, and art. During the four weeks of the unit, they will be exposed to interactive games, songs, videos and stories. In this way the content of the volcanoes unit will be very thorough, but naturally developed.

Before we start with volcanoes we have to talk about different kind of colors and shapes. A vision of Earth have to be taught because the kids have to understand first of all how our Earth is formed, showing at glance of the layers through didactic experiments. Then I would introduce the theme of tectonics plates where the kids can relate and understand the topic with real objects such as puzzles, vegetables, fruits, etc.

I strongly believe that to relate difficult topics with simple experiments is the best way to engage student's attention. Therefore, I find the volcano theme an amazing theme to introduce to my students through metaphoric objects.

OVERVIEW

Earth

We know that the earth is the third planet from the sun. It is the only planet we know of that has just the right environment for plants and animals to live in. We think earth is perfectly rounded if we see the earth from the space, but it isn't. It is slightly flat at its North and South poles and bulges a little at its middle, which is knew the equator. Four oceans are covering almost three-fourths of earth's surface. There are seven landmasses, called continents.

Inside, the planet Earth has four layers. The distance to its center from the planet's surface is about 4,000 miles. The center is called the inner core. It is a hot ball of solid iron and nickel with temperatures of 11,000°F. The outside is called the outer core. This is about 1,300 miles thick, and it is made up of very hot liquid iron and nickel. This part of the Earth moves around the inner core very slowly, making electricity that creates the Earth's magnetic field. Around the outer core is the mantle. It is about 1,800 miles thick and can be as hot as 7,500°F. Most of the mantle surrounding the outer core is solid. But some of the outer mantle is made up of partially molten, or melted, rock that moves slowly, like molasses. Outside the mantle is the Earth's crust.

The Earth's crust is very thin compared to the other layers. The crust is made up of rock and soil. It is divided into two parts, the oceanic and the continental crust. Oceanic crust is the part of Earth's lithosphere which underlies the ocean basins. It is thinner (generally less than 10 km thick) but more dense than the continental crust, about 3.3 g/cc (grams per cubic centimeter). The oceanic crust is composed of mafic basaltic rocks. Most of the present day oceanic crust is less than 200 million years old because it is continuously being created at oceanic ridges and destroyed by being pulled back into the mantle in subduction zones by the processes of plate tectonics.

The continental crust is the layer of granitic and sedimentary rock which forms the continents and the areas of shallow seabed close to their shores, known as continental shelves. It is less dense than the material of the mantle and thus "floats" on top of it. The relative low density keeps the continental crust from being re-cycled or subducted back into the mantle. For this reason the oldest rocks on Earth are within the continents rather

than in repeatedly re-cycled oceanic crust. It is also less dense than oceanic crust and considerably thicker averaging 20 to 80 km versus the average oceanic thickness of around 5-10 km. The continental crust is thickest beneath mountain ranges with a deep root. About 40% of the Earth's surface is underlain by continental crust.

The crust, the lithosphere to be more specific, the hard outer layer of the earth, is divided into about 7 major plates and perhaps as many as 12 smaller plates, c.60 mi (100 km) thick, resting upon a lower soft layer called the asthenosphere. Because the sides of a plate are either being created or destroyed, its size and shape are continually changing. Such active plate tectonics make studying global tectonic history, especially for the ocean plates, difficult for times greater than 200 million years ago. The continents, which are c.25 mi (40 km) thick, are embedded in some of the plates, and hence move as the plates move about on the earth's surface. (<http://Wikipedia>).

The boundaries of the plates can have different deformations when the plates act together; they can separate from one another (seafloor spreading), they can collide (creating mountain ranges), they can slip past one another (subduction zones, in which plates undergo destruction and re melting), and slip laterally.

Seafloor spreading is the movement of two oceanic plates away from each other which outcome in the creation of new oceanic crust (from magma that comes from within the Earth's mantle) along a mid-ocean ridge. Where the oceanic plates are moving away from each other is known a zone of divergence. If two plates collide, part of the crust is ruined in the collision and the plates become smaller.

If two oceanic plates collide, one could be pressed under the other and magma from the mantle rises, creating volcanoes in the area. If two continental plates collide, mountain ranges are formed as the colliding crust is compressed and pushed upwards.

If two plates move sideways against each other, it occurs an enormous amount of friction which makes the movement bouncy. The plates slip, then stick as the friction and pressure builds up to incredible levels. When the pressure is released suddenly, and the plates suddenly jerk apart, an earthquake will occur.

Volcanoes

A volcano is a landform built up of material erupted from the interior of the Earth. Pressure builds up below the surface, causing cracks or holes to appear in the crust. Then molten rock, called magma, and gases push up from deep inside the earth. This causes an explosion called a volcanic eruption. Magma shoots out of the volcano's opening, called crater. Volcanic ash darkens the sky. The magma flows on the surface as lava. Ash and lava can destroy life for miles around. When the ash and lava cools, it can harden into layers that form volcanoes.

Most Volcanoes come in one of three different shapes. The names used to describe them are: shield volcano, cinder cone volcano, and composite volcano. A shield volcano is wider than it is high. A composite volcano looks like a tall mountain with steep sides. A cinder cone volcano is a cone-shaped hill.

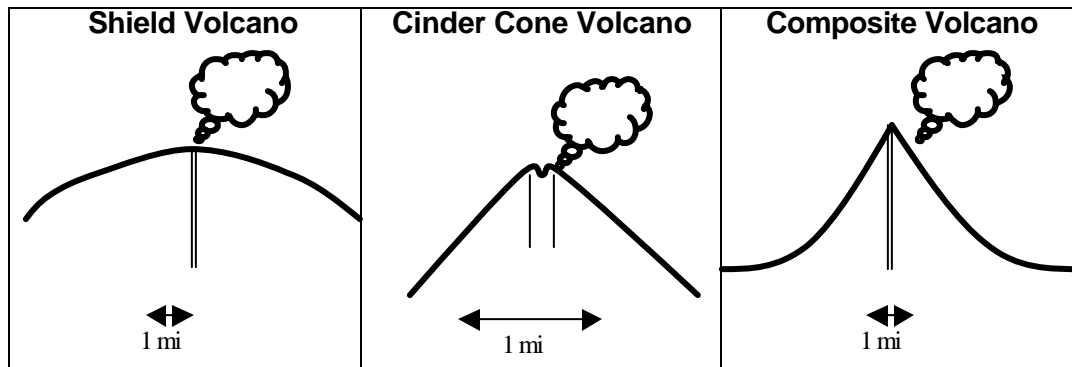


Figure 1: Main types of volcanoes

These three types of volcanoes have different kind of eruptions. The eruptions of shield volcanoes are quiet. “Like Mauna Loa on Hawaii in the Pacific Ocean, and Piton de la Fournisaise on Reunion Island in the Indian Ocean, are made up of basalt-rich lava, which is thin, runny, and spreads a long way from the vent. Shield volcanoes are mostly made up of lava and contain very little ash or cinder (approximately 95 percent lava and 5 percent ash). Cinder Volcanoes occur where an explosive eruption hurls small, solid fragments of ash and rock from the volcano’s vent. The ash and rock build up to form volcanoes that are steep-sided but not very tall. This type of volcano is found in the Craters of the Moon area in Idaho. Another is Paricutin in Mexico. Composite volcanoes they are formed by a cycle of quiet eruptions of thick lava followed by explosive eruptions of thick lava. Mount St. Helens in Washington State, Pinatubo in the Philippines, and Fuji in Japan are all examples of composite cone volcanoes.” (Bunce 14, 15).

Active volcanoes erupt often. Dormant volcanoes rest for a long time between eruptions. Extinct volcanoes will never erupt again. There are more than 600 active volcanoes on Earth. On the average, twenty to thirty volcanoes erupt each year. Living near a volcano means living with the threat of an eruption. If an eruption occurs, there is the chance for great loss of life and property. Volcanic eruptions also have an effect on the world’s weather and climate. When volcano erupts, it sends huge amounts of ash, dust, and dangerous gases into the air. Ash clouds from a volcanic eruption can climb to more than 7 miles high. Parts of these clouds can remain in the air for more than two years. These clouds can block out sunlight.

IMPLEMENTATION STRATEGIES

This thematic unit is intended for use as part of the pre-kindergarten curriculum where the majority of subjects are integrating. The lessons will focus heavily on the TEKS and PROJECT CLEAR. During the first week, the volcano topic will be introduced to the students. These introductions will be in the form of pictures, songs, real objects, and puzzles, to enhance the learning of new vocabulary words and at the same time exposed them to movements, rhythms and high order thinking activities. Allowing them to take the puzzle home can reinforce the learning process at home.

Then during the second and third week the unit will continue with, books, and manipulatives. The students can draw volcanoes, count them, spell them, match them, etc. During these weeks we are going to create a small book called “The wonderful world of volcanoes” where the student is going to represent planet Earth, including volcanoes composition, and kinds of volcanoes.

In the fourth week they can sing, dance, and start building a three -dimensional volcano model. Here they can mix colors, use shapes, and feel textures so they can appreciate the differences between the shapes, colors, and textures. Finally, they will be given an opportunity to see an explosion in their own volcano at the end of the unit.

LESSON PLANS

The lesson plans that I am going to present have been developed to half day Pre-kinder students. Most of the materials are created and supplied by me.

Be sure to provide enough material to the students. Songs can be adapted to develop movements, so teacher can change the songs.

First Week

Day 1

Objectives

Introduce students to the concept of Earth as a Planet.

Show students the composition of the Earth.

MATH.PK.3.B. Reinforce to use words that indicate where things are in space.

Materials

Blue, yellow, and green modeling clay for the land and oceans on the crust and brown for the crust, orange for the mantle, yellow for the outer core, and black for the inner core. De que esta hecha la tierra? Book, Earth Globe, Earth Photos, and Earth Pictures.

Procedure

At the beginning of this lesson I am going to read aloud pages 2 and 3 from De que esta hecha la tierra? Then I am going to show different Earth pictures, Earth photos and Earth Globe so students can see different points. After that we are going to build our own planet with modeling clay.

1. Start with the inner core, (black modeling clay) the very center of the Earth.
2. Now add the outer core, (yellow modeling clay)
3. Next wrap the mantle around the core, (orange modeling clay)
4. Now add a thin layer of brown modeling clay to be the earth's rocky crust. Then mold on the earth's surface features the oceans and continents.
5. When your modeling clay ball is complete, cut out a wedge shape to show a cross section of the earth's different layers.
6. Remember that you have to have an Earth in modeling clay, ready to show it to the kids, so they can appreciate the process and the result. During that process students will ask some questions that will be answered during that time.

Day 2

Objectives

Introduce plate tectonics concept.

E.L.A.8.B The child enjoys listening to and responding to books.

MATH.PK.3.E. The child puts together puzzles of increasing complexity.

Materials

Poster of Earth puzzle, apple, Earth puzzles in construction paper, construction paper, and De que esta hecha la tierra? Book.

Procedure

I am going to read aloud De que esta hecha la tierra?, pages 4 and 5, to introduce plate tectonics concept. Then I am going to show an apple and I am going to peel it to compare with the Earth

crust. After that I am going to use the poster of the Earth so students can appreciate the Earth plates. Once students understand that concept, everyone is going to work by themselves in small Earth puzzles that represent the Earth plates. They can take that puzzle home.

Day 3

Objectives

Show different movements of Earth's plates

- E.L.A.PK.1.C. The child understands and follows simple oral directions.
- MATH.PK. 1.C. The child counts concrete objects to five or higher.
- P.E.PK. 1.C. The child moves within a space of defined boundaries, changing body configuration to accommodate the space.

Materials

Together song, London Bridge song, I took a bath in a washing machine, song, I can dance song
Tape recorder, De que esta hecha la tierra? Book, and play-dough.

Procedure

First of all I am going to read aloud De que esta hecha la tierra? Book pags 6,7,and 8. Then I am going to play songs where kids can have different kind of movements (Apart, bump together, overlap, and slide against one another). After that, students can work by themselves with play-dough representing those movements. Therefore students will begin to see how mountains are building up.

Day 4

Objectives

Explain students the volcano's concept.

- P.D.PK.3.E. The child uses scissors.
- E.L.A.PK.3.B. The child uses new vocabulary in everyday communication.
- ML.PK.2.A. The child recognizes the danger of fire and learns to treat fire with caution.

Materials

Color paper, scissors, glue, volcano worksheets, chocolate milk, cook pot, and De que esta hecha la tierra? Book.

Procedure

I am going to read aloud De que esta hecha la tierra? Pags 10, and 11. Then we are going to do an experiment using the cook pot and the chocolate milk. Once the chocolate milk is boiling students can see how the chocolate is spilt out. It will be the perfect example for students to understand how a volcano looks like when it is erupting.

Then students will create their own volcano in paper using different color papers and also paint.

Day 5

Objectives

- E.L.A.PK.7.D. The child begins to make some letter sound/sound matches.
- E.L.A.PK.9.G. The child asks questions and makes comments about the information and events from books.
- P.E.PK.1.F. The child begins to move in rhythm.

Materials

Together song, London Bridge song, I took a bath in a washing machine, song, I can dance song, Songs (to be developed) and tape recorder.

Procedure

At that time the students are going to practice all the concepts that they have learnt during that week. We are going to do a game that relates movements with concepts about Earth, plates, mountains and volcanoes. Students have to shake, jump, reach, run, etc.

Second and Third Week

Objectives

The child will understand different kinds of volcanoes.

- | | |
|------------|--|
| E.L.A.1.b. | The child listens for different purposes. |
| E.L.A.6.d. | The child understands that illustrations carry meaning but cannot be read. |
| E.L.A.7.c. | The child begins to notice beginning letters in familiar words. |
| MATH.1.a. | The child arranges sets of concrete objects in one-to one correspondence. |
| MATH.3.a. | The child begins to recognize, describe, and name shapes. |

Materials

Construction paper , work sheets, crayons, transparency sheets, paint, markers, pencils, colors, unlined white paper, scissors, yarn sand, glue stick, songs, and Volcanoes Book. (Paul Sipiera)

Procedure

I am going to explain one theme per day. The kids are going to create a book called “ The wonderful world of Volcanoes”, “El maravilloso mundo de los volcanes”. So you as the teacher can develop one page per day.

To begin the lesson I am going to read some pages of Volcanoes Book, (it depends on the theme that I am going to develop) we are going to dance and imitate different kind of movements and then we are going to create a page for our book.

Day 6

They are going to represent the inner core as follow:

1. Get 2 pages of construction paper.
2. Get half of the transparency sheet, and draw a small point in the center.
3. Fold the construction paper in half.
4. The teacher marks where the student will cut a little smaller than the transparency.
5. Student will cut around where the teacher marked.
6. Teacher will give the student a piece of paper (black) with the inner core traced. Remember to draw a small point in the middle.
7. The student will cut the circle and glue it in the middle of the transparency; student has to put together both points.
8. The student places the transparency between the construction paper frames and glue around it.

Day 7

They are going to represent the outer core:

1. Get 2 pages of construction paper.
2. Get half of the transparency sheet, and draw a small point in the center.

3. Fold the construction paper in half.
4. The teacher marks where the student will cut a little smaller than the transparency.
5. Student will cut around where the teacher marked.
6. Teacher will give the student a piece of paper (yellow) with the outer core traced. Remember to draw a small point in the middle.
7. The student will cut the circle and glue it in the middle of the transparency. Student has to put together both points.
8. The student places the transparency between the construction paper frames and glue around it.

Day 8

They are going to represent the mantle:

1. Get 2 pages of construction paper
2. Get half of the transparency sheet, and draw a small point in the center.
3. Fold the construction paper in half.
4. The teacher marks where the student will cut a little smaller than the transparency.
5. Student will cut around where the teacher marked.
6. Teacher will give the student a piece of paper (orange) with the mantle traced. Remember to draw a small point in the center.
7. The student will cut the circle and glue it in the middle of the transparency. Student has to put together both points.
8. The student places the transparency between the construction paper frames and glue around it.

Day 9

They are going to represent the crust, the oceans, and the continents.

1. Get 2 pages of construction paper
2. Fold the construction paper in half.
3. Get half of the transparency sheet, and draw a small point in the center.
4. The teacher marks where the student will cut a little smaller than the transparency.
5. Student will cut around where the teacher marked
6. Teacher will give the student a piece of blue paper that will represent oceans and a piece of green paper with continents traced. Remember to draw a small point in the center of the blue circle.
7. The student will cut the circle and glue it with the continents creating the Earth.
8. The student will glue the Earth in the middle of the transparency. Putting points together.
9. The student places the transparency between the construction paper frames and glue around it.

Day 10

They are going to color, cut and glue the plate tectonics.

Day 11

They are going to trace a shield volcano dot, spell it and color it.

Day 12

They are going to trace a composite volcano dot, spell it and color it.

Day 13

They are going to trace a cinder volcano dot, and spell it and color it.

Day 14

They are going to color a volcano and write their parts.

Day 15

They are going to develop the cover of the book. They have to write their name and represent their own volcano and their own eruption.

When you have all the pages ready you can staple them or use the fasteners or use yarn.

At the end of the third week you have to have an amazing book about volcanoes.

Fourth Week

Objectives

- | | |
|-------------|--|
| SCI.PK.1.A. | Demonstrates safe practices and appropriate use of materials. |
| SCI.PK.1.C. | Show an interest in investigating unfamiliar objects, events, and organisms. |
| SCI.PK.1.E. | The child describes observations. |
| SCI.PK.1.F | The child begins to perform simple investigations. |
| SS.PK.4.B. | Cooperates with others in a joint activity. |
| MATH.PK.1.I | Combine/separate/name “how many” concrete objects. |
| ELA.PK.6.A. | Attempt to write messages as part of playful activity. |
| ELA.PK.5.H. | Connect information/events in books to real life experiences. |

Materials

Modeling clay, vinegar, red food coloring, baking soda, a plastic beaker, a large cardboard box, damp sand.

Procedure

Day 16

Kids can modeling their own volcano with color clay. It is going to be a small volcano so they can manage the model.

Day 17

Kids are going to build a medium mountain with modeling clay. Leave the top open and make tunnels in the clay, leading down to the holes in the side of the funnel.

Day 18

Make a long cardboard funnel and fit it neatly around the beaker. Put the clay shape inside it.

Day 19

Pile up sand in the box and mold it into their volcano shape. Make sure that you leave the top of the volcano and all the side tunnels clear.

Day 20

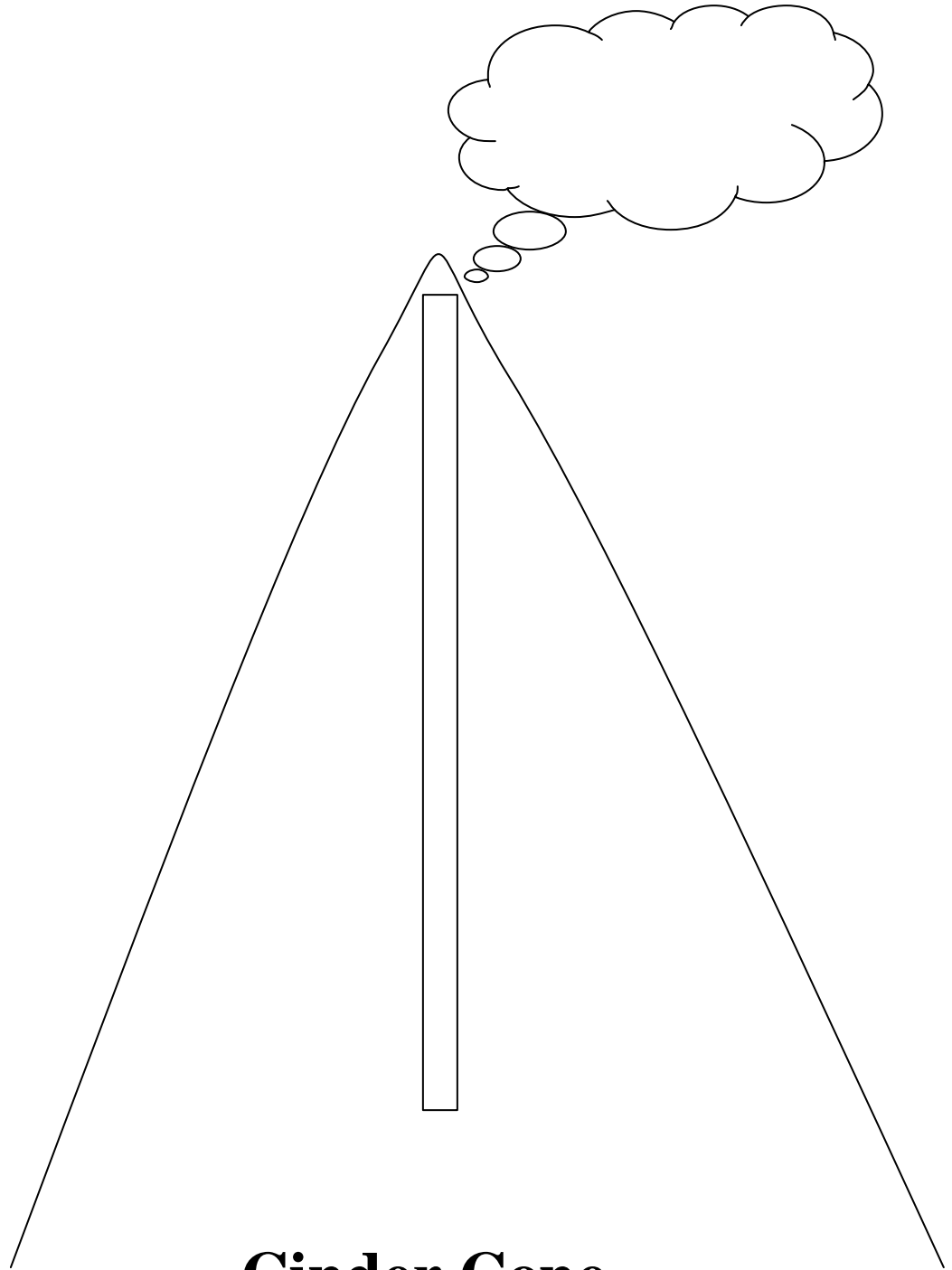
Color the vinegar with red food coloring. Put the baking soda into a narrow beaker. It should be about half full.

When it is time for an eruption, pour the red vinegar into the beaker and stand back!

BE CAREFUL when you try this project, it can be very messy!!

Try to do the project outside!!

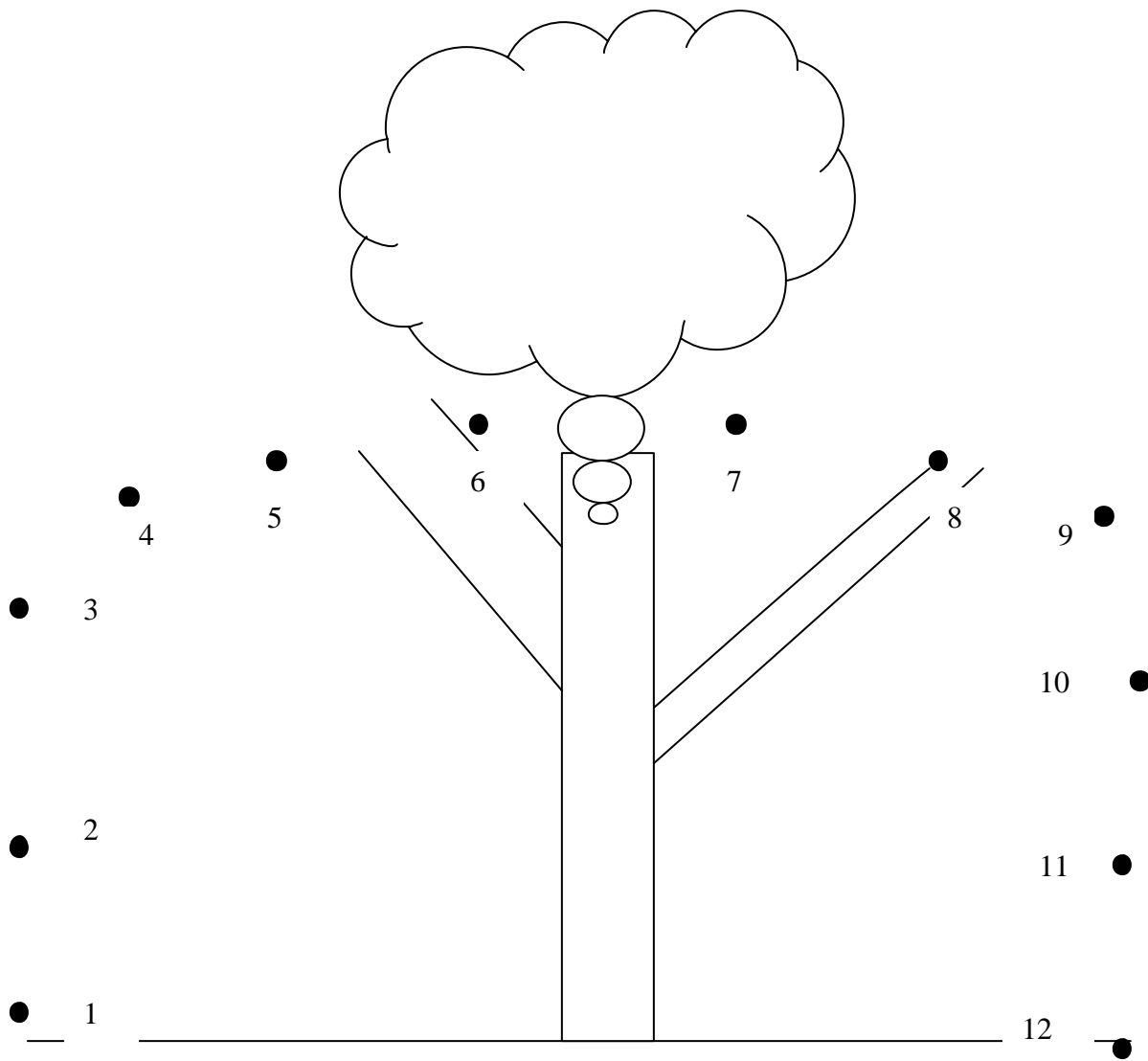
Volcan Cono de Ceniza



Cinder Cone

Nombre: _____

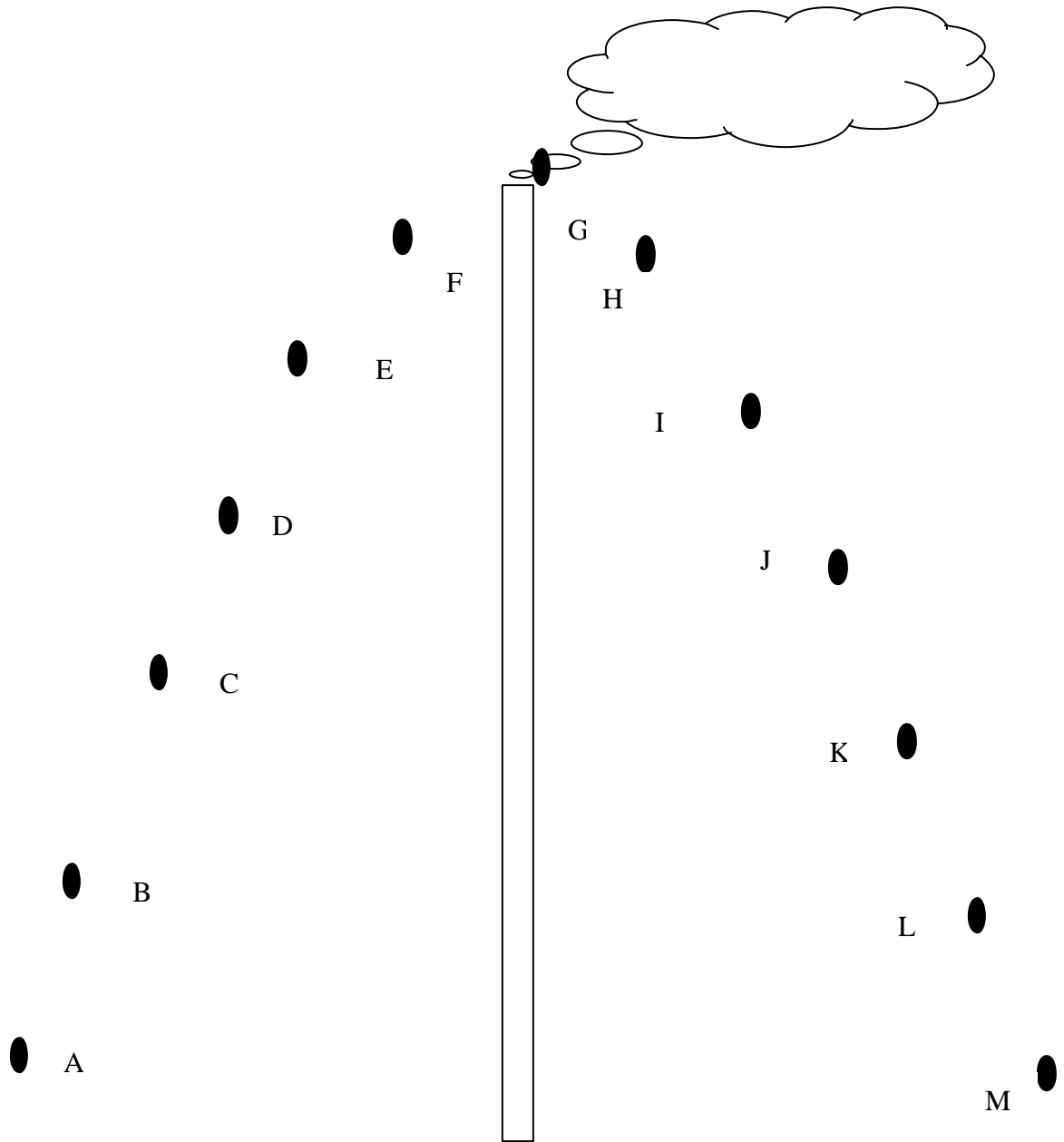
Volcan en escudo



Shield Volcano

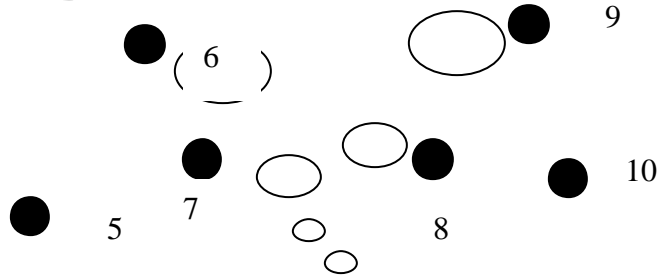
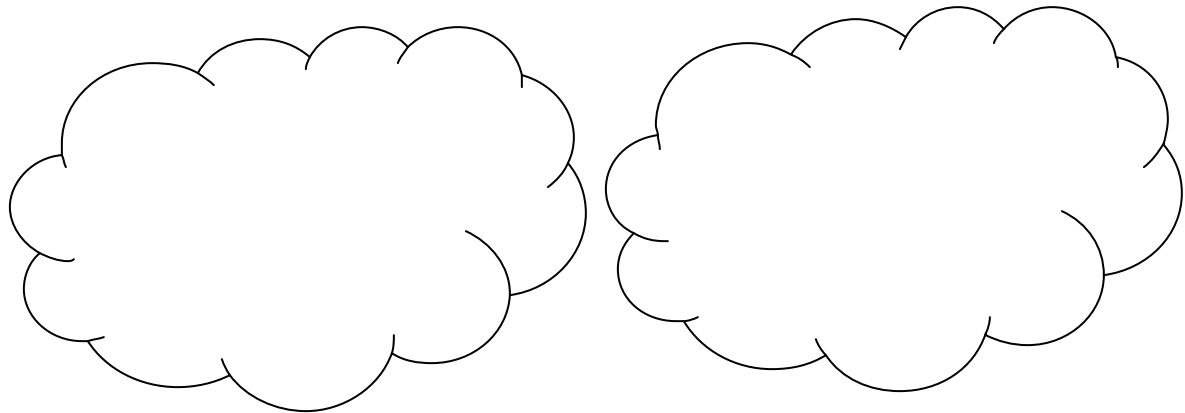
Nombre: _____

Volcan Compuesto



Composite Volcano

Nombre: _____



11

4

12

3

13

2

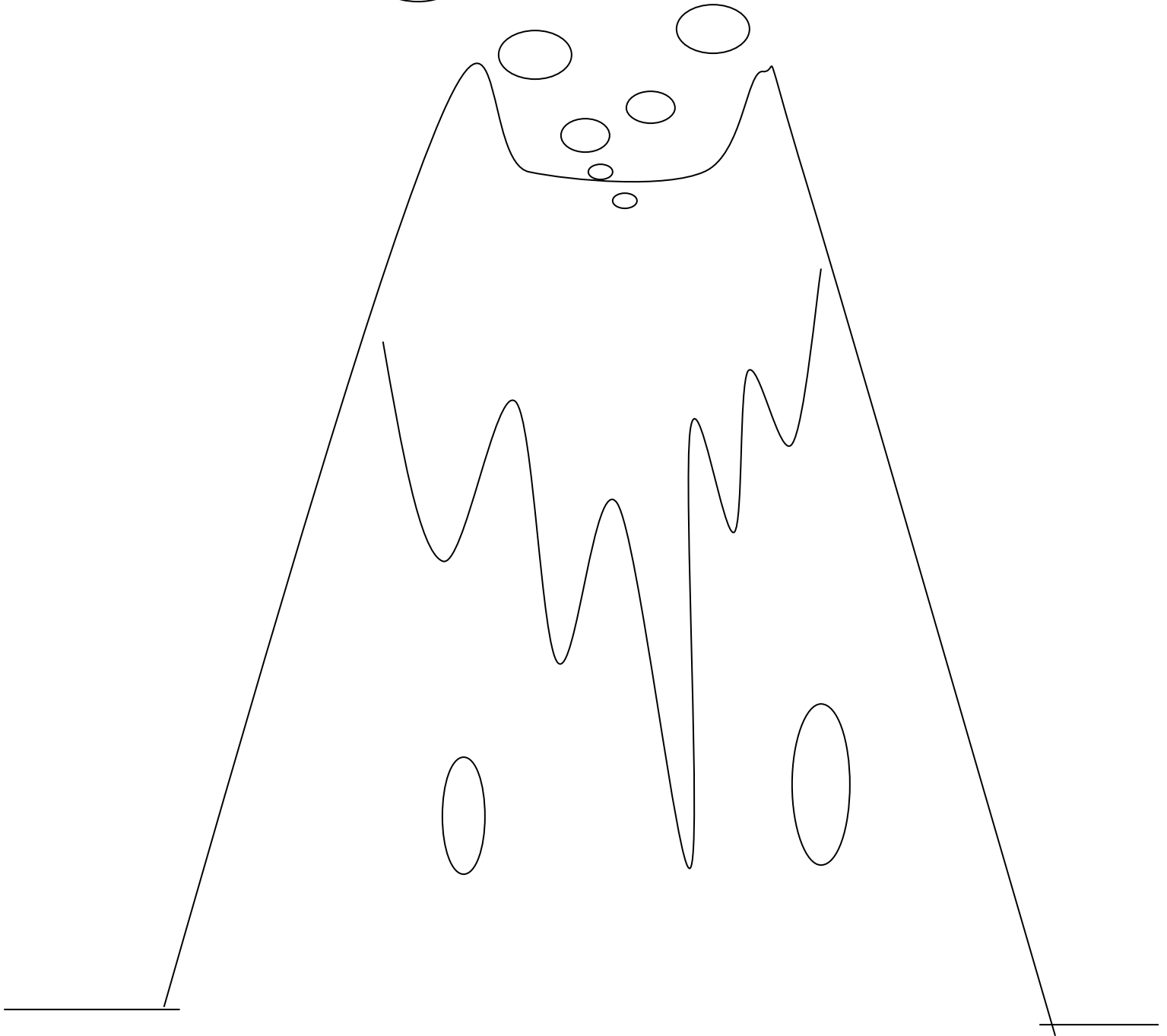
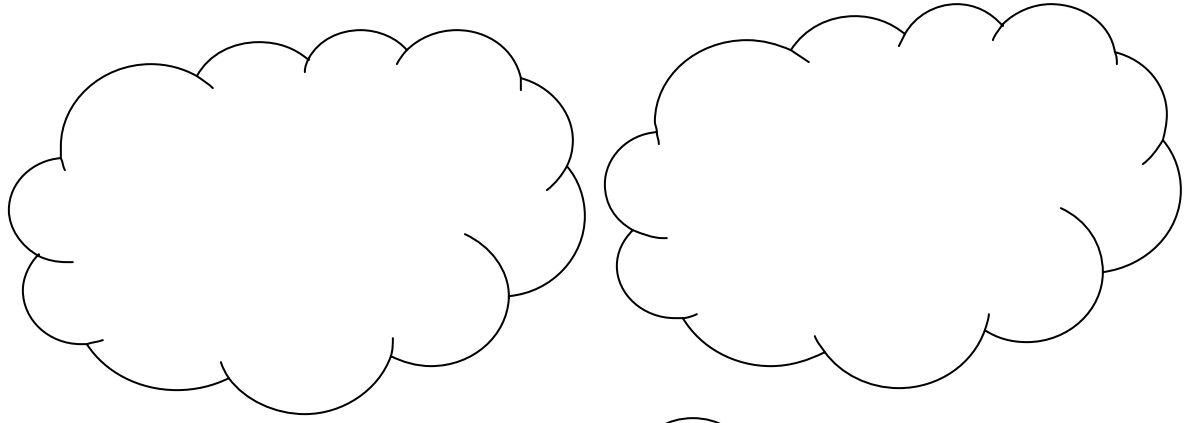
14

1

Volcan

15

Nombre: _____



This page is the guide to make the book.

Cut around each box and use the model to help you locate each one.

Inner Core

Núcleo Interno

Outer Core

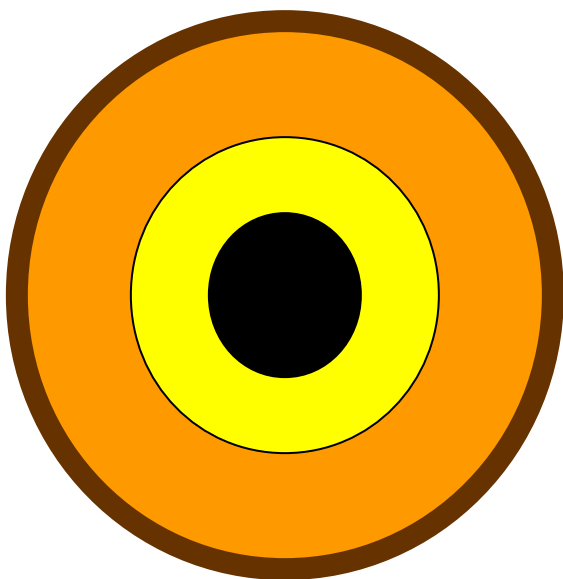
Núcleo Externo

Mantle

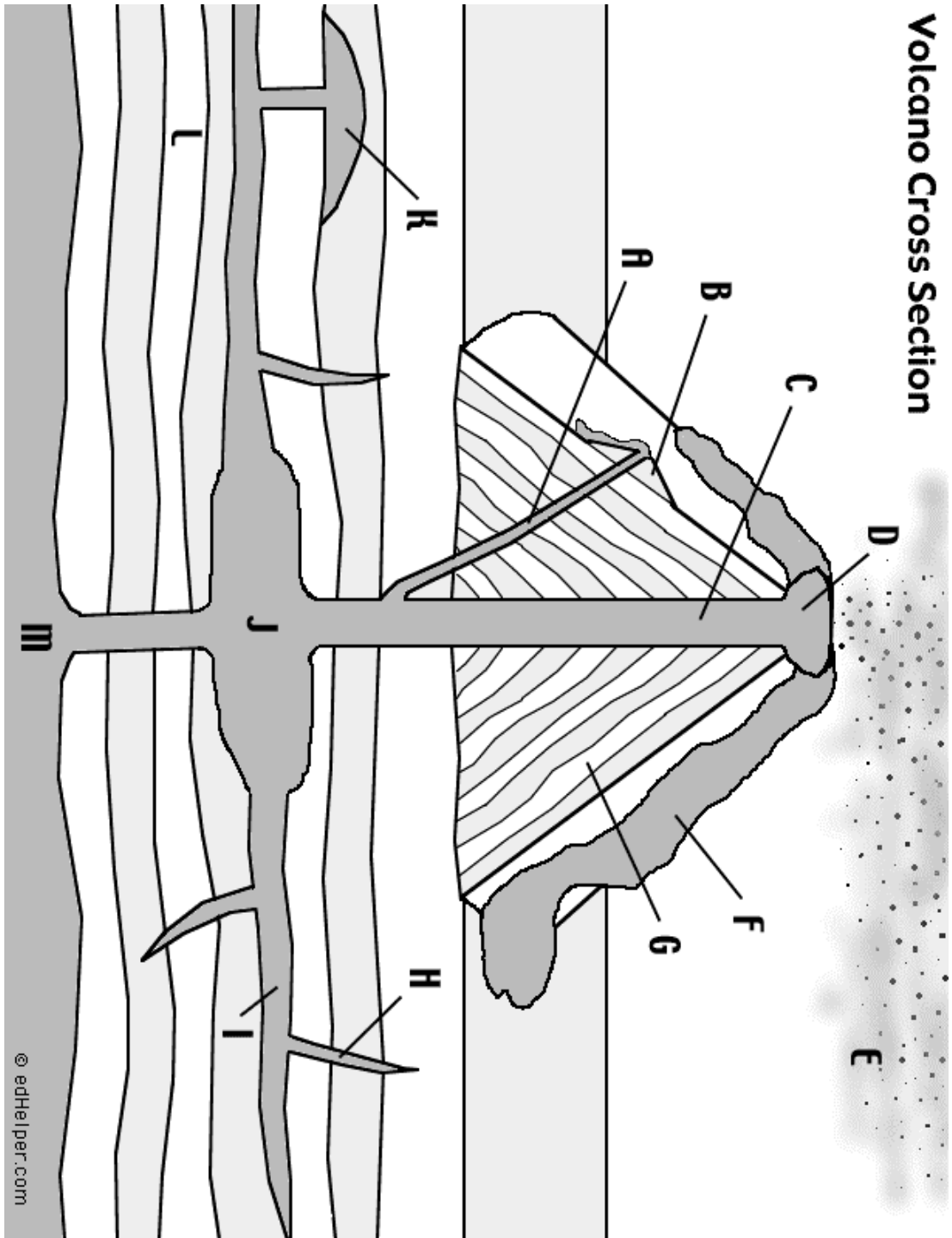
Manto

Crust

Corteza Terrestre



Use this address to have diagram of a volcano.
<http://www.edhelper.com/volcanodiagram1.htm>



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A children's book that describes how planet Earth is formed.
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This book is dedicated to introducing young children the concept of volcano.
- Educative Helper. June 2005 <http://www.edhelper.com/volcanodiagram1.htm>
This web site has developed different diagrams about volcanoes.
- Wikipedia. June 2005 http://www.en.wikipedia.org/wiki/continental_crust
This web site explains everything related to the Earth Crust.

Supplemental Resources

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This book provides good ideas to elementary classroom teacher to develop different geologic concepts with simple materials.
- Barber, Nichola. *Earthquakes and Volcanoes*. Londres: Evans Brothers Limited, 1997.
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