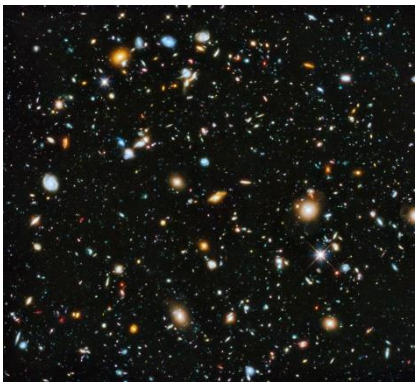
MONTESSORI PRIMARY

Module 3

The Great Lessons

Addlo Montessori Training Center

Great Lesson 1



First Great Lesson - Coming of the Universe and the Earth

The First Great Lesson is the most memorable and is often done on the very first day of school, there are many versions. I will provide you with two that are used internationally and another version which combines a bit of the First and Second Great Lessons (which can be used as an introduction with the younger children)- This will be presented to you later on in the course.

The first Great Lesson involves a story that uses a number of different demonstration to tell the story of how our universe came to be. It includes the use of a balloon and gold stars for the big bang, water and paper for the attraction of particles, solid liquid and gas for the states of matter and finally the explosion of a volcano to bring to life the story of the beginning of the universe.

This lesson leads to the study of:

- Astronomy: Children can investigate and do big work and projects on solar system, stars, galaxies, comets, constellations
- Meteorology: they can study the wind, currents, weather, fronts, erosion, water cycle, clouds, glaciers
- Chemistry: lots of science experiments can be done in the following areas, states of matter, changes, mixtures, reactions, elements, atoms, periodic table, compounds, molecules, chemical formulas, equations, lab work, experimentation
- Physics: also magnetism, electricity, gravity, energy, light, sound, heat, friction, motion, experimentation
- Geology: children love investigating the following: types of rocks, minerals, land forms, volcanoes, earthquakes, plate tectonics, ice ages, eras of the earth
- Geography: they can also study maps, the globes, latitude/longitude, climates, land/water form names, continent and country research

These lessons were originally told from a religious perspective: Maria Montessori was a Catholic Christian. The Montessori Method is used in most countries today, it is therefore important to note one of the beautiful aspects of the Montessori Method: **adapt the stories to fit your own community or school ethos.**

Materials Needed-

A black cloth

A ballon (black filled with glitter or confetti)

A pin

A pitcher with water

A clear glass bowl

Pieces of paper or the glitter and confetti

A big jar

A rack with three test tubes

Honey, coloured water and oil

A Volcano mould

Bicarbonate of soda

Vinegar

Red food colouring

A long match stick

Washing up liquid

Protective eye goggles

3 jars each with a stone, water, air

A Kettle or flask with hot water

A container with a cover (preferably clear)

The Charts: Buy or Print the ones provided make them large enough so the children can see them.

This version is adapted from Montessori Kiwi's version

The Story	Actions /Props etc.
Long ago, before anyone existed, even before anyone's great- great-great-grandparents were born, there was no earth, no sky and no universe. Perhaps there was only a big quiet and empty space… But perhaps there wasn't just empty space, maybe there was some sort of Nothing something. Maybe it was what some people call God or Spirit. It is a mystery, so that not even the cleverest of scientists know what really happened. Most scientists now do agree though, that long, long ago, there was no universe and no earth, in fact there were none of our planets in the solar system. There was nothing. Dark. Black, nothing.	A black cloth either a circle or long rectangular strip with all the props you will use spread out on it;
Then something happened in the great nothing. A **giant explosion**, and with	A black ballon with

this everything in the universe was formed. When the explosion happened in space all of the matter from the great explosion broke apart and went further and further out expanding into space. This hot matter expanded so far that we can't even measure it.	some star shaped pieces stuffed into it, it should be already blown up. Hide it and use a pin to set off the explosion.
As the hot matter broke apart it turned into the first stars in the universe. They were very hot and burned very brightly. Billions of them lit up the dark, black space.	Chart - Stars
Things happen in a certain way in our universe, we call it 'the nature of things.' For example some objects are pulled towards other objects. This is called **gravity**. Gravity made the stars move towards each other, the stars turned into groups called **galaxies**.	Experiment with a bowl or water and pieces of paper
So stars and galaxies existed in the universe but the planets didn't! So where did the planets come from? You guessed right, this is another one of those mysteries! Some scientists think though that there was a spinning cloud in the universe that did something. This spinning cloud was made up of space dust and it spun through space. Then it was hit by something big. That something big was a giant **shockwave** that was like a wave. When the shockwave hit the spinning cloud it broke apart as the shockwave was so powerful.	Chart – Spinning Universe
The spinning cloud started breaking apart into pieces. Some of the pieces moved towards other pieces and grew bigger like when you are **making iyan** (pounded yam) **or Eba** (gari in hot water) and the mixture of pounded yam or gari attaches to other pieces and becomes one mound. Like the iyan or eba these pieces were hot, but this time they were really very hot!	Chart – Iyan Eba
One bit was really hot and it became really bright. It became the center of the other pieces. That bright bit was **the sun**. The planets started to move around it, held by its energy they went round in circles or orbits. I wonder did you know that one million earths could fit into the sun!	Chart – The Sun
While we think Earth is special there are lots of the other things in our solar system family too. This family is made up of **planets**, **stars**, **moons**, **asteroids** and more. Our Solar system is part of an even bigger family called the **Milky Way.**	Chart- The Planets
Anyway let's go back to the story of the earth for a little bit. When the Earth was really young it was very, very hot. The top or surface of the earth was hotter than an exploding volcano. It had **rivers of melted rock called molten rock.** There was no life on earth or even air to breathe at that time.	Chart – Molten Rock

Then **meteorites** began to crash into the earth which made it even hotter!	
There were different types of rocks on the surface of the earth. Some were really heavy and some were lighter. The really heavy rocks sunk to the middle of the earth and the lighter bits stayed near the top, this was another example of gravity… and another example of the nature of things.	Experiment – Pour honey and oil into coloured water and watch them settle.
Over many thousand, tens of thousands, hundreds of thousands even millions of years, as the earth's surface slowly cooled, it began to get harder. It got harder and harder, really hard, and as it got harder it formed a thin crust like the crust on a loaf of bread. Underneath it though things were still really very hot. The stuff beneath the crust was hot rock. This hot rock began to push upwards and made holes in the earth. The hot rock pushed up into the sky making a huge noise and bringing out lots of colour. These holes are what we now call **volcanoes**.	Experiment – Volcano eruption (Volcanic Eruption Chart)
Something else was interesting about these volcanoes. They released something we call gas. You can't see gas, but it is very important to life today. The Earth now had three different types of matter: **solid, liquid and gas**.	Presentation of the 3 matter (States of Matter Chart)
As the earth continued to cool, its crust got little cracks in it and water formed beneath the crust, which later escaped as a gas called water vapour. The water vapour went into the air above the earth. This is what we call **evaporation**. Then something else happened, the gas began to cool, as the gas cooled drops of water were made. This kept happening and soon there were many **raindrops** which fell onto the earth cooling it down.	Experiment – Pour hot water from a kettle or flask into a container point out the steam, then cover it up for a minute or so observe the droplets of water on the inner of the cover. (Evaporation Chart)
The rain fell for many millions of years on the earth, filling it with water and cooling it at the same time. No one was there then, but if they had been there they would have only seen oceans. I wonder how life came to be on earth. Well that is a story for another day…	Chart - The Blue Planet

This is the Version handed down by Mario Montessori – Maria Montessori's son. Taken from the Moteaco website.

God Who Has No Hands

From the very beginning people have been aware of God. They could feel Him though they could not see Him, and they were always asking in their different languages who He was and where He was to be found.

"Who is God?" they asked their wise men.

"He's the most perfect of beings," was the answer.

"But what does He look like? Does He have a body like us?"

"No, He has not got a body. He has no eyes to see with, no hands to work with and no feet to walk with, but He sees everything and knows everything, even our most secret thoughts."

"And where is He?"

He is in heaven and on this earth. He is everywhere."

"What can he do?"

"Whatever He wishes."

"But what has God actually done?"

"What He has done is all that has ever happened. He is the Creator and Master Who has made everything, and all things He has made obey His will. He cares and provides for them all, and keeps the whole of His creation in the most wonderful harmony and order.

In the beginning there was only God. Since He was completely perfect and completely happy, there was nothing He needed. Yet out of His goodness He chose to create and all the He willed came into being; the heavens and the earth, all that is visible, and all that is invisible. One after another He made the light, the stars, the sky, and the earth with its plants and animals. Last of all He made man. Man, like the animals, was made out of particles of the earth, but God made him different from the animals and like Himself, for into his body which would die He breathed a soul which would never die."

Many people thought this was just a tale. How could someone with no eyes and no hands make things? If God is a spirit who cannot be seen or touched or heard, how could He have made the stars that sparkle overhead, the sea which is always astir, the sun, the mountains, and the wind? How could a spirit make the birds and fishes and trees, the flowers and the scent they shed around them? Perhaps He could make invisible things, but how could He make the visible world? It is all very well, they thought, to say that God is everywhere, but who has set their eyes on Him? How can we be sure He is everywhere? They tell He is the Master whom everybody and everything obeys, but why on earth should we believe that?

And it really does seem impossible. We who have hands could not do these things, so how could someone who has no hands do them? And can we imagine animals and plants and rocks obeying God? The animals do not understand when we talk to them, so how could they be obedient? Or the winds and the sea and the mountains? You can shout and scream and wave your arms at them, but they cannot hear you for they are not even alive, and they certainly won't obey you.

Yes, that is how it seems to us. But, as you will see, everything that exisits, whether it has life or not, in all that it does and by the very fact of its being there, actually obeys the will of God.

God's creatures do not know that they are obeying. Those that are inanimate just go on existing. Those that have life move and go on living. Yet every time a cool wind brushes your cheek, its voice, if we could hear it, is saying: 'Lord, I obey.' When the sun rises in the morning and colors the glittering sea, the sun and the sunbeams are whispering, 'My Lord, I obey.' And when you see a bird on the wing, or fruit falling from a tree, or a butterfly hovering over a flower, the birds and their flight, the tree and the fruit and its fall to the ground, the butterfly and the flower and its fragrance are all repeating the same words: 'I hear, my Lord, and I obey.'

At first there was chaos and darkness was on the face of the deep. God said: 'Let there be light', and there was light. Before that there was only the deep, an immensity of space with no beginning and no end, indescribably dark and cold. Who can imagine that immensity, that dark and coldness?

When we think of dark, we think of night; but our night would be like brilliant sunshine in comparison with that darkness. When we think of cold, we think of ice. But ice is positively hot if you compare it with the coldness of space, the space that seperates the stars: as hot, you might say, as a blazing furnace from which no heat can escape. In this measureless void of cold and darkness light was created. There appeared something like a vast, fiery cloud which included all the stars that are in the sky. The whole universe was in that cloud, and among the tiniest of stars was our own world; but they were not stars then; as yet there was nothing except light and heat. So intense was the heat that all the substances we know - iron, gold, earth, rocks, water - existed as gasses, as insubstantial as the air. All these substances, all the materials of which the earth and the stars are composed, wer fused together in one vast, flaming intensity of light and heat - a heat which would make our sun today feel like a piece of ice.

This raging fiery cloud of nothingness, to huge to imagine, moved in the immensity of freezing space, which was also nothingness, but infinitely vaster. The fiery mass was no bigger that a drop of water in the ocean of space, but that drop contined the earth and all the stars.

As this cloud of light and heat moved through empty space little drops fell from it. If you swing the water out of a glass, some of itholds together and the rest breaks up into separate drops. The countless hosts of stars are like these little drops, only instead of falling they are constantly moving round in space, in such a way that they can never meet. They are millions of miles from each other.

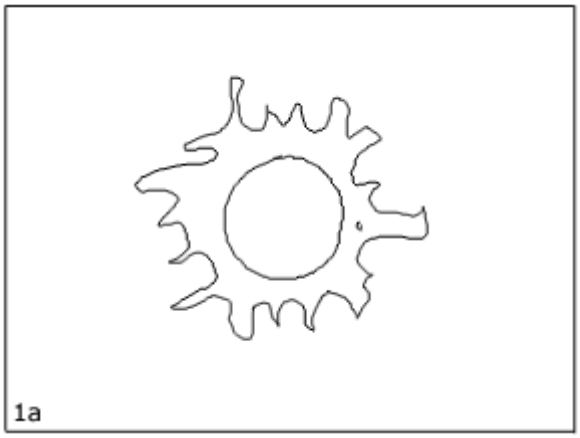
Indeed, some stars are so far away from us that it takes millions of years for their light to reach us. Do you know how fast light travels? (the children might answer: 100 mph, 200mph...?) No, much faster. It travels 186,000 - not per hour, but per SECOND. Imagine how fast that is! It means that in one second it can travel 7 times around the whole world. And do you know how big the world is? If we were to drive at 100 mph continuously, all day long and all night long, without stopping, it would take us more than 10 days to cover that distance. And yet the light covers it 7 times in one second! You 'click' with your fingertips, and it has gone around the earth 7 times already!

So, you can imagine how far some of these stars are, that it takes their light 1 million years to reach us?

Then there are so many stars that scientists have calculated that if each of them were a grain of sand, all the stars together would cover up all the states from Virginia to New York up to the height of 200 meters! One of these stars, one of these grains of sand among those thousands of billions of grains of sand, is our sun, and one millionth part of this grain is our earth. An invisible speck of nothingness.

One wouldn't think so. The sun doesn't look so big. But that is because it is so far away. The light from it takes about 8 minutes to reach us and if we were to travel the same distance at 100 mph it ouwld take us a little more than 106 years to reach the sun. In fact, the sun is one million times bigger than the earth. The sun is so big that just one of its flames could contain 22 earths.

(CHART 1A: Earth Compared to the Sun)



When God's will called the stars into being, there was no detail He had not planned. Every scrap of the universe, every speck which we might think too tiny to matter, was given a set of rules to follow. To the little particles which were like smoke, like vapor - which could only be distinguished as light and heat - moving at a fantastic speed he said: 'As you become cold you shall come closer and become smaller.'

And so, as they cooled they moved more and more slowly, clinging closer and closer to each other and occupying less and less space. The particles assumed different states which man called the solid, the liquid, or the gaseous state.

(DEMONSTRATION: Three States of Matter)

Three States of Matter

Materials:
3 identical glass bowls on a tray
one contains ice, another water, and the other is empty

Everything we know is either a gas, a liquid, or a solid, and which of the three states it is at the moment depends on how hot or cold it is.

Then God gave some other instructions. Each of the tiny little particles was given a special love for certain particles and a special dislike for certain others. Some were attracted to each other and some were not. Just like human beings, they like some, and refuse to have anything to do with others. So they form themselves into different groups.

(DEMONSTRATION: Forces of Attraction)

Forces of Attraction

sprinkle the small pieces of paper (confetti) onto the surface of the water and observe

Materials:
bowl of water with a large surface area
small pieces of paper

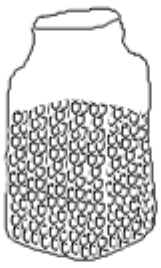
In this way, the particles combined and formed themselves into different groups.

In the solid state, God has made the particles cling so closely together that they are almost impossible to separate. They form a body which will not alter its shape unless one applies force. If a piece is broken off, the particles will still cling together. If, for instance, you start chipping a flint, the flint and the chips still remain solid pieces of stone.

When it came to liquids, God said: 'You shall hold together also, but not so very closely, so that you will have no shape of your own and will roll over each other.'

(DEMONSTRATION: Model of a Liquid)

Model of a Liquid



Materials:
a clear, sealed container, approximately 1/2 filled with small ball bearings or marbles

'Thus you shall flow and spread, filling every hollow, every crevice in your path. You will push downward and sideways, but never upwards.' That is why, though we can put our hands in water, we cannot put them inside a rock.

And to the gasses He said: 'Your particles shall not cling together at all. They can move freely in all directions.'

But as the particles were all so different individuals, they did not become solid or liquid or gas all at the same time. At certain temperature some remained soild, others became liquid and still others became gaseous.

(DEMONSTRATION: State of Matter and Heat)

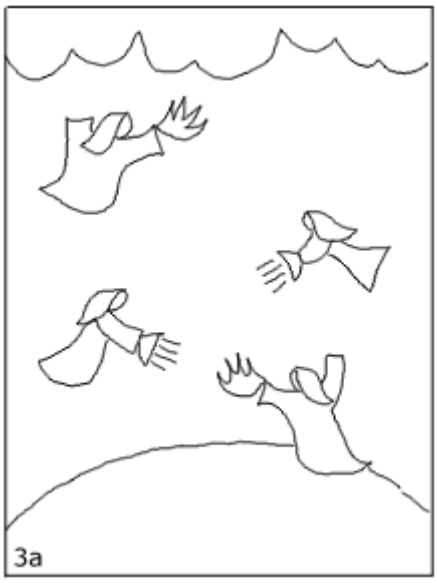
State of Matter and Heat

Materials:
3 metal dishes
heat source
extinguisher
apron & goggles
ice, solder, iron object

And so, while obeying these laws, the little drop of nothingness that was to become our world, the blazing mass, went on spinning and spinning around itself and around the sun in the tremendous cold of space.

And as time went on, the outer ring of this mass began a dance, the dance of the elements. The particles that were at the outermost edge became cold and shrank. Huddling together they hurried to the earth, but as soon as they approached the hotter part, they became hot and up they went again. Like little angels, they carried a bucket of hot, burning coal into space, and returned with some ice.

(CHART 3A: The Dance of the Elements)



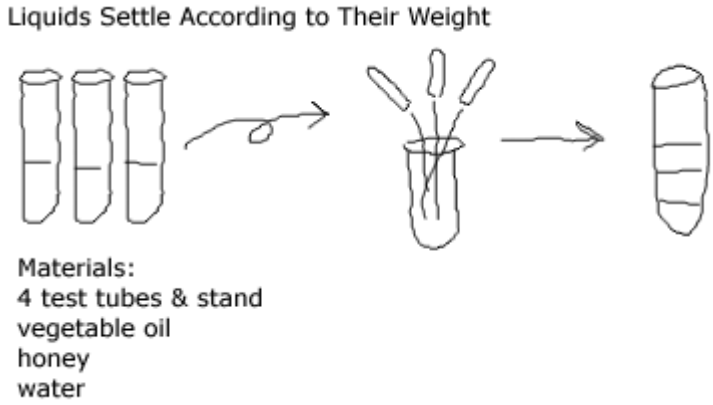
How marvelous it is! And how simple! If you become hot you expand and as you expand, you become lighter and soar upwards, like a bubble of air in the water. But, if you become cold, you shrink and fall as a grain of sand sinks to the bottom of a pond.

Because of this law the earth gradually changed from a ball of fire to the earth we know. This was the law that the tiny radiant particles obeyed as they danced their dance; particles to minute to be seen or even imagined, yet numerous enough to have produced the world.

For hundreds, thousands, millions of years this dance went on. Finally, the particles settled down, like tired dancers, and one after the other, they became first liquid and then solid and as they became liquid or solid some of them joined others to which they were attracted, forming new substances.

The heavier ones went nearer to the heart of the earth and the lighter ones floated above them like oil floating on the water.

(DEMONSTRATION: Liquids Settle According to Their Weight)



A thin scum was formed, like the skin which forms on milk when it is boiled and left to cool. It seemed as though the earth had taken some shape. But the elements inside this skin were still very hot. They felt trapped. They wanted to get out. What could they do

otherwise? They had to follow the law of God: 'If you are hot, you expand.' There was no place to expand and so they burst out. They broke the skin and it was like a terrible fight.

(DEMONSTRATION: Volcano)

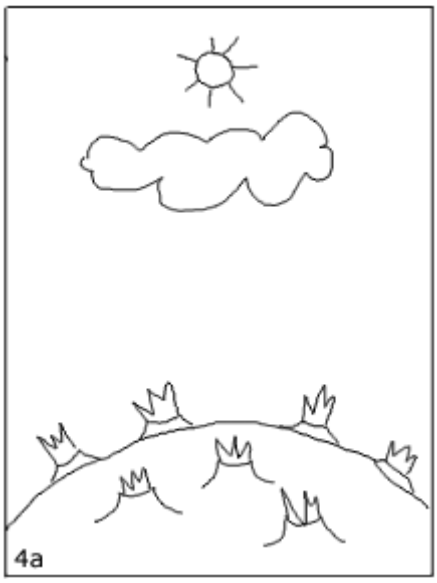
Forces of Particles

Materials:

volcano model	baking soda & vinegar
red food coloring	white dish detergent

The water that formed on the surface turned immediately into vapor and went up as the hot stuff came out from inside the earth.

(CHART 4A: Volcanoes and Cloud)



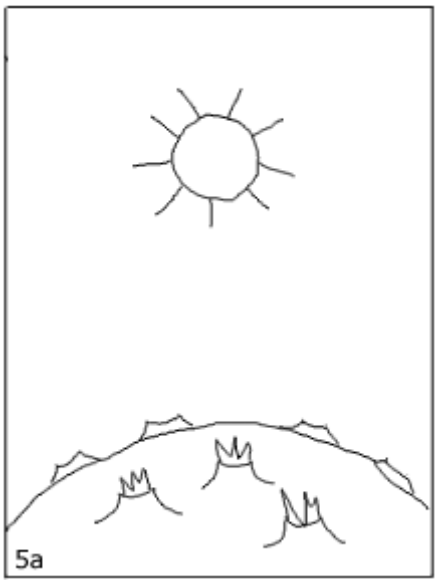
There were also ashes. A veil of clouds was drawn to cover the earth so that nobody could see what was going on. The sun was ashamed of them!

Eventually, the fighting ceased. As everybody cooled down, more and more gasses became liquid, more and more liquids became solids. The earth itself shrank and became wrinkled like an old apple that has been left in a cupboard. The wrinkles are mountains and the hollows are the oceans.

For, as the rocks had cooled down, water was able to return to the earth and it rained and rained. And the water, being liquid, filled every hollow and crevice found in its path.

Thus the oceans were formed. Above them was the air, the air that we breathe. The cloud had disappeared.

(CHART 5A: Volcanoes and Water)



The veil had withdrawn and the sun could once again smile upon its beautiful daughter, the earth.

Rocks, water, air: solids, liquids, gasses. Today, as it was yesterday and millions of years ago, God's laws are obeyed in the same way. The world spins round itself and round and round the sun. And today, as it was millions of years ago, the earth and all the elements and compounds it is made of, as they fulfill their tasks, whisper with one voice:

'Lord, Thy will be done; we obey.'"

Follow up Work could include:

Geography: Volcanoes, Plate tectonics, Mountains of the world, Rocks and Earthquakes

Creation Stories: Myths and Legends: Other world perspectives of how the world was created.

Physics: Motion/Forces, Electricity, Gravity, Magnetism, Light

Water Cycle: Evaporation, Condensation, Properties of the States of Matter, the water cycle 3 part cards, Renewable energy and keeping the water ways clean.

The Earth and the Solar System

Asteroids

Meteors

Comets

The planets and their core features

The Earth’s atmosphere

The Earth’s composition