

The Moon and How it looks from Earth Phases of the Moon

Lori Brown

Introduction and Rationale

William A. Oberle, Jr. Elementary School in the Christina School District in New Castle County, Delaware. It is one of 18 elementary school in the district. Oberle is serving about 700 students in grades K-5. Oberle Elementary School serves 55% ESL population. The school district has a mix of city and suburban schools. The district gets some of their students from the city of Newark and Bear, Delaware and from the suburban parts of Delaware which is middle of New Castle County. Christina School District Serves around 15,000 students. My classroom is made up of fifteen students. These students are comprised of seven girls and eight boys. There are six African Americans, three Caucasian, and six Latinos.

Our Curriculum is based on Instructional Priorities for each grade level. Focusing on specific rigorous research-based strategies in whole & small group content area instruction that are aligned with our District's Curriculum Maps which are grounded in National Standards. Differentiated Instruction, small group (6-7 students) skill specific instruction, is the foundation of all classroom lessons provided by Highly-Qualified Teachers & Paraprofessionals. Students are provided 90 mins. ELA Instruction & 45 mins of Intervention (another small group instruction) and 60 mins. Math Instruction and daily 60 mins of Intervention. Our instructional programs are aligned with our Student data-driven School Success Plan. The Academic and School Climate RTI Teams work collaboratively to create a comprehensive educational environment for all students and staff.

This is my first unit through Delaware Teachers Institute (DTI). This one is for Science or Writing. My participation in DTI has helped me do my research for my content that I have needed to give to my students for the content and rigor, so they can gain the rigor and knowledge. This will increase the student's involvement in the lesson. I hope that learning about the different phases of the moon, that the students can describe what they see of the moon and draw a picture of the moon. When we are more involved with moon, we will talk about the astronauts that have landed on the moon. If there could be life on the moon, what would it be like to live on the moon? I will talk about how the moon was once hot with flowing lava and it cold over billions of years ago. I'll talk about how when the moon cooled, craters and mountains were formed. The mountains and craters are named after scientists. I'll also talk about how big and long some the craters can be. Why are some of the craters visible and why are some of the craters not visible?

Learning Objective

There are several course objectives and aspects to moon phases that I will address in the unit. Specific to the course, students will learn that: (1) how the moon was created billions of years ago and how the moon cooled, (2) what are the different moon phases, what does waxing, waning, gibbous, crescent, and quarter mean, (3) people visiting the moon, and (4) could there be life or could there ever be life on the moon.

These objectives and aspects meet the science instruction for the next Generation Science Standards (NGSS). Includes the following: Space Systems: Patterns and Cycles: 1- ESS1 - 1 Use observations of the sun, moon, and stars to describe patterns that can be predicted. 1 - ESS1 – 2 Make observations at different times of the year to relate the amount of daylight to the time of year. The last two practices are also objectives of the Common Core State Standards With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers (CC1W6) and with guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question (CC1W8).

Key Concepts

Students will understand that: How the moon was created hot flowing with lava for millions of years. The moon might come from the Earth. Then the moon cold after millions of years. Talk about the craters and the mountains that have created from the cooling of the lava. The different phases of the moon. The waxing of the moon. The waning of the moon. The gibbous, quarters, and crescent how are the appearance of the moon different? Discuss the different movements of the moon that you see from Earth. When do you see these patterns, where do you see the patterns, and what time of day? How astronauts have visited the moon. What did the astronauts do while they were on the moon? Has there ever been life on the moon? Can there be life on the moon. If there could be life on the moon would you live there?

Moon Creation ¹

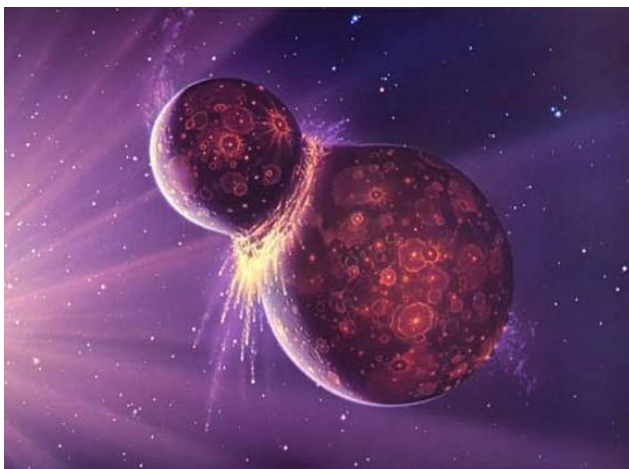


Figure 1: Creation of Moon Photo from Space and Astronomy News – Artist Illustration

The theory that the moon was formed out of the debris left over from a collision between Earth and an astronomical body the size of Mars, approximately 4.5 billion years ago. Moon samples indicate that the Moon's surface was once molten. The Moon has a relatively small iron core. They proposed that one of these objects may have collided with the Earth, ejecting refractory, volatile-poor dust that could coalesce to form the Moon. This collision could potentially explain the unique geological and geochemical properties of the Moon. Not all the ring material need have been swept up right away: the thickened crust of the Moon's far side suggests the possibility that a second moon about 1,000 km in diameter formed in a Lagrange point of the Moon. The smaller moon may have remained in orbit for tens of millions of years. As the two moons migrated outward from the Earth, solar tidal effects would have made the Lagrange orbit unstable, resulting in a slow-velocity collision that "pancaked" the smaller moon onto what is now the far side of the Moon, adding material to its crust. Lunar Magma cannot pierce through the thick crust of the far side, causing lesser Lunar Maria, while the near side has a thin crust displaying the large Maria visible from Earth. The Moon is an astronomical body that orbits planet Earth and is Earth's only permanent natural satellite. It is the fifth-largest natural satellite in the Solar System, and the largest among planetary satellites relative to the size of the planet that it orbits. The Moon is after Jupiter's satellite Io the second-densest satellite in the Solar System among those whose densities are known. The Moon is in synchronous rotation with Earth, and thus always shows the same side to Earth, the near side. The near side is marked by dark volcanic Maria that fill the spaces between the bright ancient crustal highlands and the prominent impact craters. After the Sun, the Moon is the second-brightest regularly visible celestial object in Earth's sky. Its surface is dark, although compared to the night sky it appears very bright, with a reflectance just slightly higher than that of worn asphalt. Its gravitational influence produces the ocean tides, and the slight lengthening of the day by 2 milliseconds longer.

The Moon's average orbital distance is 384,402 km (238,856 miles), or 1.28 light-seconds. In comparison to the sun from the Earth it is 93 million miles or 8 light minutes away. This is about thirty times the diameter of Earth. ²“The Moon's apparent size in the sky is almost the same as that of the Sun, since the star is about 400 times the lunar distance and diameter. Therefore, the Moon covers the Sun nearly precisely during a total solar eclipse. This matching of apparent visual size will not continue in the far future because the Moon's distance from Earth is gradually increasing.” (Olpem 2007)

Moon Craters and surface

There was astronomer who found craters on the face of the moon that has the dark and bright circles. Marias are the smooth plains of the moon. Maria also means sea. The Terral are the highlands of the moon. The lunar Maria are the dark plains formed by volcanos that used to be active billions of years ago. The reason why these areas appear dark is because the iron on the surface of the moon. The side of the moon that we see the Maria is only 16%, there is more on the dark side of the moon. Both the Maria and the

Highlands exhibit large craters that are the result of meteor impacts. There are many more such impact craters in the Highlands. Lighter surfaces are the lunar highlands, which receive the name of terrae. These are the brightest areas when looking at the moon. Highlands or the uplands, make up 84% of the Moon's surface. They show regional differences, with ridges and grooves in the central and northern part of the nearside of the Moon; choppy, irregular hills and valleys in the Sea of Serenity; concentrations of overlapping craters in the Sea of Nectar; and other hilly or mountainous landscapes. Terra plains that are smooth and level like Maria, but lighter in color, occupy crater floors and other depressions near the Sea of Rains and Eastern Sea. The moon's craters are formed by rocks in space (asteroids and meteoroids) that have collided with the moon. The craters remain intact for millions of years, since there is no ... wind, atmosphere, running water or anything else to erode them away.

Moon Phases

When you look up into the night sky, or sometimes the clear, blue sky of the middle of the day, you may see the moon. Sometimes it looks large and completely round. Other times it may seem as if a small slice has been removed or appear to be a slim crescent. What gives? How can the moon change?



³ Moon Phases by Kids Astronomy

The answer lies not in the changing of the moon at all! Rather, it is our view of the moon that changes as the earth, moon, and sun shift positions each day and night. Let's try to visualize what is happening in the relationship between the moon, the sun, and the earth over the course of about a month. The sun is stationary; that's the easy part. The earth moves in two ways - it spins on its own axis and it moves in a near circular orbit around the sun. Simultaneously, the moon moves in similar ways; the moon spins on its own axis while orbiting the earth.

Also, key to our lesson is the understanding that the moon is not a light source. What we see as the illumination of the moon is the light of the sun reflecting off the moon. As the earth and the moon revolve and orbit, the amount of sunlight that hits the face of the moon that we see each night; these shifts in sunlight hitting the moon are what account

for the shape of the moon changing. “At the early stage after the formation of the Moon, tidal drag between the Earth and Moon locked it into a synchronous orbit with the Earth. Hence it always keeps the same face to the Earth. Moreover, their mutual gravity produced some asymmetry in towards the Earth a little as well as having the thinnest part of its crust on the Earth-facing hemisphere.”

You can simulate a simpler version of what's going on right at home. First, find a dark room and introduce to it a singular source of light, pointing at you. A lamp light bulb sitting on a desk/cart would work well. Now, stand directly in front of this light, holding parallel to the light a ball. The lamp light bulb is the sun, your head is the earth, and the ball is the moon.

Although the shape of the moon as we see it will change (infinitesimally) every day, there are officially four **phases of the moon**. A phase of the moon is defined by the shape the moon appears to be when viewed from Earth. The four phases of the moon are:

- **New moon**, when the moon is not visible from Earth, even though it is in the sky
- **First quarter moon**, when - after a new moon - one half of the moon is visible
- **Full moon**, when all the moon is visible from Earth
- **Third quarter moon**, when - after a full moon - the *other* half of the moon is lit

Now, of course, the moon does not shift exactly from no moon to half, half to full, full to half-moon. Rather, the changes are subtle with each passing night. In between each new moon and first quarter moon, there will be a few nights where the moon's light is shaped like a crescent. Similarly, after a third quarter moon, there will be another crescent, as the shape of the moon shrinks back towards another new moon.

New Moon

This is the beginning portion of the moon's phases. A new moon happens when the moon is located between the sun and the Earth. We typically cannot see a new moon since the dark side of the moon is facing the Earth. New moons can create a solar eclipse where the moon blocks the sun's rays and creates a shadow on parts of the Earth.

Waxing Crescent

During the Waxing Crescent phase, the moon travels east in the sky to the west as the Earth rotates. The waxing crescent phase of the moon begins once we can see a tiny sliver of the moon after a new moon. There are times when you might be able to see the rest of the moon as well, even if it is dark because of a phenomenon called “earthshine” in which the Earth reflects sunlight to the moon. This phase occurs a few days after a new moon.

First Quarter

The next phase of the lunar cycle is the first quarter. During this phase happens when you can see half of the moon that is lit. The name “first quarter” comes from the fact that at this stage the lunar cycle is 1/4 of the way completed. Not everyone will see the same halves of the moon lit up during this phase, primarily because it depends on your location. So, some people may see the right half illuminated while others might see the left half illuminated. It will be in the same part of the moon lit, just that it may appear upside down.

Waxing Gibbous Moon

This phase essentially covers the time between the first quarter phase and the full moon phase. The words waxing gibbous describe what the phase is well. Waxing means growing larger, and the word gibbous refers to the shape, so waxing gibbous essentially means “growing shape”. The moon will get more and more illuminated until the moon is fully illuminated, which starts the next phase.

Full Moon

As you probably already know, a full moon is when we see the entire moon face is illuminated by the sun. Full moons occur when the sun and moon are on opposite sides of Earth. Technically the moon is only 100% illuminated by the sun for a few moments, but this phase also covers when the moon looks full but isn't. This is the half of the moon that we see all time.

When the moon is at its closest point to the Earth in its orbit it is called a supermoon, and at its farthest point, it is called a micro-moon. Another cool thing that occasionally happens during a full moon is when the moon passes through our Earth's shadow, called a lunar eclipse. During a lunar eclipse, the moon will be a reddish color.

Waning Gibbous Moon

Like we covered above, waxing means increasing and waning means decreasing. So, in this case, the waning gibbous moon means that the shape is decreasing. The waning gibbous phase lasts until the moon is half illuminated.

Third Quarter Moon

This phase is basically the exact opposite of the first quarter moon. This is when the moon is half lit up in the sky, and it also signals when the lunar phase is 3/4 of the way completed.

Waning Crescent Moon

This is the final stage of the lunar cycle. This phase starts when the sun illuminates less than half of the moon and continues until the New Moon phase. During this phase, we can also see the effect of “Earthshine”, just like we can during the new moon phase.

This phase “ends” when the moon and the sun rise at the same time, which starts the lunar cycle over again starting with the new moon.

Interesting Lunar Facts:

Our tides are based on the lunar cycle. Twelve people have walked on the moon, and they are all American. We have some ideas how the moon formed, and it has been theorized that the moon and the Earth at some point billions of years ago collided. It is hypothesized that the moon has a similar mantle that Earth has, but scientists are unsure about the mantle and core of the moon. At one point the moon had volcanoes. After the USSR sent a spacecraft to the moon in the 50’s the USA was close to blowing up a nuke on the moon to show dominance and superiority (luckily cooler heads prevailed on that decision). NASA is planning to send astronauts back to the moon in the future and setting a lunar base up may also be in the works.

Why does the moon seem to change its shape every night? Why can I see the moon in the daytime?

The answer to both questions is the same. It’s that the moon is a world in space, just as Earth is. Like Earth, the moon is always half illuminated by the sun; the round globe of the moon has a day side and a night side. And, like the Earth, the moon is always moving through space. From our earthly vantage point, as the moon orbits around Earth, we see varying fractions of its day and night sides. These are the changing phases of the moon. And the moon is in the daytime sky about half the time. It’s just that it’s sometimes it’s so near the sun we don’t notice it. How can you understand moon phases? Here are four things to remember:

When you see the moon, think of the whereabouts of the sun. After all, it’s the sun that’s illuminating and creating the dayside of the moon. Moon phases depend on where the moon is with respect to the sun in space. The moon, Earth and sun are aligned with Earth in the middle. The moon’s fully illuminated half – its dayside – faces Earth’s night side. That’s always the case on the night of a full moon. Go outside. No matter what phase of the moon you see in your sky, think about where the sun is. It’ll help you begin to understand why the moon you see is in that phase. The moon rises in the east and sets in the west, each day. It has to. The rising and setting of all celestial objects is due to Earth’s continuous daily spin beneath the sky. Just know that – when you see a thin

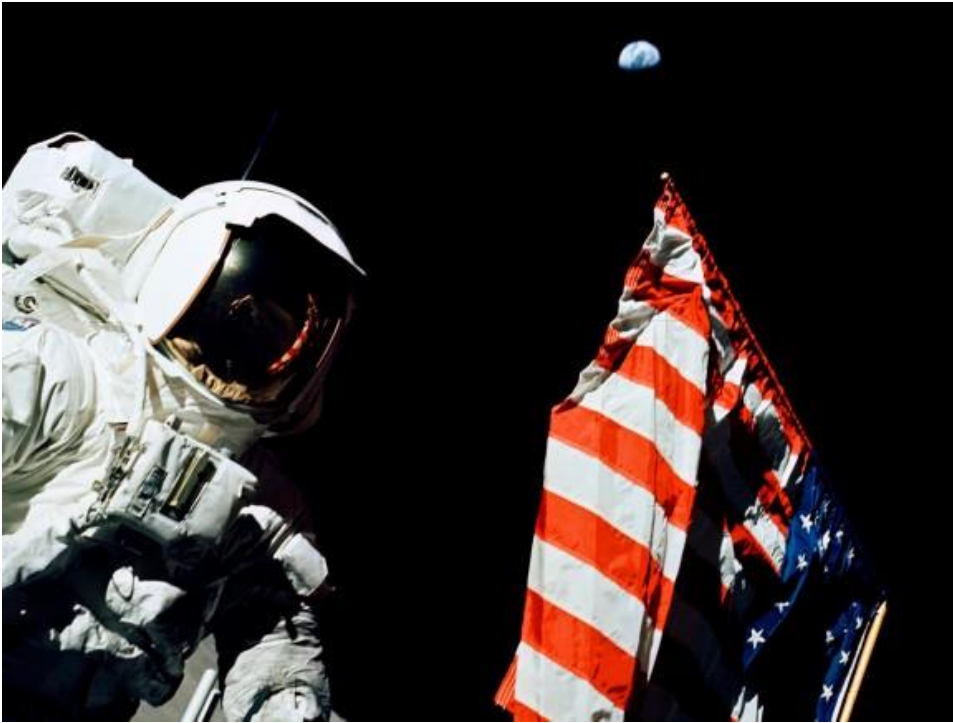
crescent moon in the west after sunset – it's not a rising moon. Instead, it's a setting moon. At the same time, though ...

The moon takes about a month to orbit the Earth. Although the moon rises in the east and sets in the west each day (due to Earth's spin), it's also moving on the sky's dome each day due to its own motion in orbit around Earth. This is a slower, less noticeable daily motion of the moon. It's a motion in front of the fixed stars. If you just glance at the moon one evening – and see it again a few hours later – you'll notice it has moved westward. That westward motion is caused by Earth's spin.

The moon's own orbital motion can be detected in the course of a single night, too. But you must watch the moon closely, with respect to stars in its vicinity, over several hours. The moon's eastward, orbital motion is easiest to notice from one day (or night) to the next. It's as though the moon is moving on the inside of a circle of 360 degrees. The moon's orbit carries it around Earth's sky once a month, because the moon takes about a month to orbit Earth.

The moon's orbital motion is toward the east. Earth must rotate a little longer to bring you around to where the moon is in space. Thus, the moon rises, on average, about 50 minutes later each day. The later and later rising times of the moon cause our companion world to appear in a different part of the sky at each nightfall for the two weeks between new and full moon. Then, in the two weeks after full moon, you'll find the moon rising later and later at night.

Astronauts Visiting the Moon



⁴ (Astronaut walking on the moon with an American Flag 1976)

If you were born after the Apollo program, and maybe even if you remember those days, it seems almost unbelievable that NASA sent manned missions to the moon 239,000 miles away. People continue to express sadness at the fact that the Apollo lunar missions were so long ago, and that soon there will be no one left alive who went to the moon. Today, Alan Bean—the fourth man to walk on the moon and the last surviving member of the Apollo 12 mission—passed away at the age of 86. Which makes it the perfect time to remember—or get to know—the only 12 people who ever walked on a body other than planet Earth.

Neil Alden Armstrong

Navy test pilot, engineer, and Korean War veteran Neil Armstrong left the Navy in 1952 but continued in the Naval Reserve. He worked as an experimental test pilot for the National Advisory Committee for Aeronautics (NACA) beginning in 1955, which evolved into NASA. Armstrong was assigned as an astronaut in 1962, and flew on the Gemini 8 mission in 1966, where he performed the first successful space docking procedure. Armstrong was selected to be the first man to walk on the moon, as the Apollo 11 mission was planned, for several reasons: he was the commander of the mission, he didn't have a big ego, and the door of the lunar lander was on his side. Although the first steps on the moon are what he will always be known for, Armstrong considered the

mission's biggest accomplishment was landing the lunar module. He later said, Pilots take no special joy in walking: pilots like flying. Pilots generally take pride in a good landing, not in getting out of the vehicle.

Armstrong along with his crew were honored with parades, awards, and acclaim after their return to Earth, but Armstrong always gave credit to the entire NASA team for the Apollo moon missions. He resigned from NASA in 1971 and became a professor of Aerospace Engineering at the University of Cincinnati for eight years. Armstrong served on the boards of many corporations and foundations, but gradually withdrew from publicity tours and autograph signings. He didn't particularly care for fame. Neil Armstrong died on August 25, 2012, at age 82. His family released a statement that concluded: "For those who may ask what they can do to honor Neil, we have a simple request. Honor his example of service, accomplishment and modesty, and the next time you walk outside on a clear night and see the moon smiling down at you, think of Neil Armstrong and give him a wink."

Edwin "Buzz" Aldrin

After graduating third in his class at West Point in 1951 with a degree in science, Buzz Aldrin flew 66 combat missions as an Air Force pilot in the Korean War. Then he earned a PhD at MIT. Aldrin joined NASA as an astronaut in 1963. In 1966 he flew in the Gemini 12 spacecraft on the final Gemini mission.

Aldrin accompanied Neil Armstrong on the first moon landing in the Apollo 11 mission, becoming the second person, and now the first of the living astronauts, to set foot on the moon. Aldrin had taken a home Communion kit with him, and took Communion on the lunar surface, but did not broadcast the fact. Aldrin retired from NASA in 1971 and from the Air Force in 1972. He later suffered from clinical depression and wrote about the experience but recovered with treatment. Aldrin has co-authored five books about his experiences and the space program, plus two novels. Aldrin, who is now 88 years old, continues to work to promote space exploration.

Charles "Pete" Conrad

Pete Conrad was a Princeton graduate and Navy test pilot before entering the astronaut corps in 1962. He flew on the Gemini V mission and was commander of Gemini XI. Conrad was commander of the Apollo 12 mission, launched during a lightning storm which temporarily knocked out the command module's power shortly after liftoff. When Conrad stepped onto the moon, he said, Whoopee! Man, that may have been a small one for Neil, but that's a long one for me. Conrad later flew on the Skylab 2 mission as commander with the first crew to board the space station. He retired from NASA and the Navy in 1973, after which he worked for American Television and Communications Company and then for McDonnell Douglas.

Alan Shepard

Alan Shepard was an American astronaut, naval aviator, test pilot, and businessman. In 1961 he became the first American to travel into space, and in 1971 he walked on the moon. A graduate of the United States Naval Academy at Annapolis, Shepard saw action with the surface navy during World War II. He became a naval aviator in 1946, and a test pilot in 1950. He was selected as one of the original NASA Mercury Seven astronauts in 1959, and in May 1961 he made the first manned Project Mercury flight, MR-3, in a spacecraft he named Freedom 7. He became the second person, and the first American, to travel into space, and the first space traveler to manually control the orientation of his craft. Shepard commanded the Apollo 14 mission, piloting the Apollo Lunar Module Antares to the most accurate landing of the Apollo missions. At age 47, he became the fifth, the oldest, and the earliest-born person to walk on the Moon, and the only one of the Mercury Seven astronauts to do so. During the mission, he hit two golf balls on the lunar surface.

Atmosphere of the Moon

Has there ever been life on the moon? On the moon, there's no air to breathe, no breezes to make the flags planted there by the Apollo astronauts flutter. In fact, the layer is so thin that the blanket is only deemed to be almost an atmosphere. This thin layer above the lunar surface is technically known as an "exosphere". In an exosphere, the gas molecules are so distanced that they never seem to collide. The dust and atmosphere can have serious consequences for astronauts planning to travel to the moon. Moondust stripped Apollo spacesuits threadbare. Understanding the material floating in the lunar atmosphere should help space exploration programs to design the next generation of spacesuits and lunar equipment. Oxygen does not exist on the moon. Today, the Moon is about as inhospitable to life as it gets. The little water that's there is trapped in ice or rock. It's otherwise dry and airless, fluctuating in temperature by hundreds of degrees anywhere the sun shines. Research has shown that the Moon may have been shockingly habitable in the past, shortly after the Moon formed, and when volcanic activity was at its highest.

The key to it all is heat and lots of energy. The Moon formed after a collision between Earth. Just after the smash up, there was lots of water vapor and enough that the Moon could have had a fairly or substantial atmosphere and pools of water on the ground. Volcanic activity was also high, which could have replenished the atmosphere with water vapor from deep in the interior. That all happened roughly 4 billion years ago. By the time volcanic activity settled down some 500 million years after the collision, the atmosphere couldn't cling on and much like Mars, the Moon dried up. But in that 500 million-plus year span, all the ingredients for life may well have been present. That habitable era also fell during a period of frequent asteroid bombardment, so the inner solar system may have shared with the Moon ingredients to make life possible. Asteroids

could have even struck early Earth and transported primitive bacteria to the surface of the Moon. The short span of lunar life didn't really have long to evolve much beyond single-cell organisms. However, there is abundant evidence that the early lunar water is still trapped within rock now.

Will there ever be life on the life on the moon?

The moon could have supported life twice in its history, according to a new study. It's possible that 4 billion and 3.5 billion years ago, the moon had liquid water, an atmosphere, and a magnetic field. It could have even had organic material. These conditions may have lasted for tens of millions of years — long enough for life to emerge. To search for any signs of past life on the moon, we'd need a close examination of the lunar surface. We may not need to travel far from our home planet to find a spot in our solar system that could once have supported life.

Long ago, Earth's moon may have had conditions in which life could arise. In fact, such conditions could have arisen on the moon during two different periods, each tens of millions of years long, the study suggests. The scientists are not saying that life ever existed on the moon — just that the conditions that make life as we know it possible seem to have been in place billions of years ago. At least some of those key conditions could have existed simultaneously on the moon. "If liquid water and a significant atmosphere were present on the early moon for long periods of time, we think the lunar surface would have been at least transiently habitable," When we look for signs of life on other planets and moons, clues that can indicate a climate supportive to life include liquid water, an atmosphere that would help keep water stable on the surface, a magnetic field offering protection from solar and cosmic radiation, and organic compounds that could make up life's building blocks. At least some of those key conditions could have existed simultaneously on the moon. If liquid water and a significant atmosphere were present on the early moon for long periods of time, we think the lunar surface would have been at least transiently habitable. Astronauts and rovers have never found any evidence of life on the moon, and even if organic material did once exist on our planet's satellite, we don't know if any traces remain.

The idea that the moon could once have been habitable is based on a series of discoveries, mostly made within the past decade, that show the moon isn't as dry as we thought. There's probably still water ice in polar craters and water deposits trapped in the moon's interior. Billions of years ago, there could have been good amounts of liquid water on the surface, the new study says.

To understand why, a bit of lunar history is needed. Sometime around when our solar system settled into its current layout — about 4.5 billion years ago — a proto-Earth and another planetary body likely collided and were vaporized, according to a paper

published earlier this year. ⁵“There are some similarities between the lunar rocks and the exposed mantle materials we find on the Earth.” (North 2007)

As this theory goes, the super-heated doughnut of molten, vaporized rock and liquid — called a synestia — cooled, then the moon emerged, after which the remaining cloud of vapor condensed to form the Earth. For a long time after its formation, the moon was largely molten, with an ocean of magma spewing gases into its sky.

Those gases could have been enough to create an atmosphere. As that molten ocean finished solidifying (around 4 billion years ago), there could also have been deep pools of liquid water on the moon's surface. That time period, the new study suggests, was the first-time conditions on the moon could have supported life.

The second time was during a period of intense volcanic activity 500 million years later — 3.5 billion years ago. That activity could have created an even more dense atmosphere with more water on the lunar surface, the study says. According to calculations cited in the paper, there could have been liquid water on the surface for 70 million years during that period, especially if there was a magnetic field protecting the moon from solar winds

Mission Patch

Every mission that NASA ever had for manned mission there was a mission patch. The mission patches went along with what the mission represents. A mission patch is a cloth reproduction of a spaceflight mission emblem worn by astronauts and other personnel affiliated with that mission. It is usually executed as an embroidered patch. The term space patch is mostly applied to an emblem designed for a manned space mission. Traditionally, the patch is worn on the space suit that astronauts and cosmonauts wear when launched into space. Mission patches have been adopted by the crew and personnel of many other space ventures, public and private.

Strategies

The strategies that I will be using are graphic organizers, turn and talk cooperative learning and effective questioning. The graphic organizers will be used to help with the different phases of the moon. The vocabulary words with the different phases of the moon will be defined.

Cooperative learning will be used since students will be paired up to do work, and research. An example of pairing students' strategy is that students are paired by their reading ability or high level of readers with low level readers and medium to low level reading ability. First list the students in order from the highest to lowest according to reading ability. The highest to lowest according to reading ability. Next, divide the list in

half, then place the top student in the first list with the top student in the second list. Continue until all students have been partnered. Remember to be sensitive to pairings of students with any special needs, including learning or emotional needs. You can adjust your pairings as necessary.

I will also use effective questioning. Higher ordering thinking questions to help students with critical thinking skills. Students need these skills as they prepare for their future.

Classroom Activities

My unit will five lessons. These lessons range from one to five days, with taking four weeks to complete. The lesson will be delivered using the blending learning model. The blending learning model requires the teacher to deliver the introductory content to the students. Then once the content is delivered, any online component can be shown and completed in the classroom. As students are working, they check in with their teacher for progress, updates, or questions. Once the online component is completed, the students can complete the written part of the assignment.

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Lesson One: How was the moon made?

Day 1

On the first day of the lesson, students will be introduced to how scientists believe that the moon was made. Scientists believe that 4.5 billion of years ago that something hit the Earth really fast that caused part of the Earth was blown off from the explosion. The Earth during this time was very hot with liquid lava. There were active volcanos on the surface of the moon. As millions and billions of years have pasted the moon's surface has cooled down. The lava has cooled and has caused many craters and mountains. As we have looked at the moon's surface and visited the moon's surface, there are samples of moon that have been brought back. How have those samples been brought back? Brainstorm ideas how did the astronauts bring back the samples from the moon?

Show a video in how the moon was formed.

⁶<https://www.youtube.com/watch?v=VZVNOjVnPsQ>

Day 2

On day 2, students will brainstorm ways that scientists get moon samples back to Earth? This is a whole group activity where the students brainstorm up ways that scientists get moon samples back to Earth. Once the brainstorming activity ideas are finished, then the students are to write their own paper in how moon samples are brought back to Earth. Writing activity: How did the astronauts/scientists bring back the samples from the moon?

Day 3

On day 3, the students will learn about the craters and the mountains of the moon. The moon has many different craters on the surface of the moon. The craters appeared after the volcano's lava dried up. The craters were formed. Craters are formed nearly everyday by things that hit the moon. The craters can be very big in size. The crater looks like bowl shapes. The Terrae is the light area or highlands of the Moon that you see at night. Mountains, valleys, plains, and hills with this combination of the surface features of an area of land is called a landscape. The landscape of the Moon is very different from that of Earth. The lunar landscape is covered by craters caused by the impacts of asteroids and meteorites that crashed into the Moon from space. When you look at the Moon from Earth you notice dark areas and light areas. The dark areas are called Maria. They are solid, flat areas of basaltic lava. From about 3.0 to 3.5 billion years ago the Moon was continually bombarded by meteorites. Some of these meteorites were so large that they broke through the Moon's newly formed surface, then magma flowed out and filling the craters. Scientists estimate volcanic activity on the Moon ceased about 1.2 billion years ago.

Lesson Two: Introduction to Moon Phases

Day 4

On day 4, the students will learn the vocabulary words for phases of moon. The students will make their vocabulary cards that goes with the phases of the moon. Vocabulary words: New Moon, Waxing Crescent, First Quarter, Full Moon, Waxing Gibbous, Full Moon, Waning Gibbous, Third Quarter, and Waning Crescent. Introduction to the moon phase activity. Every night a student will be assigned to take home The Moon Phase Calendar. The student assigned will observe the moon and then put it in the day that they are assigned. They will draw the moon how they observe it.

Day 5

On day 5, the students will learn about what waxing and waning mean for the moon. The students will learn more about the Lunar Calendar for their activity.

What is waxing and waning?

As the New moon begins its orbit and we see more and more of the moon, this is called Waxing. After the moon gets to its Full phase, we start to see less and less of the moon. This is called Waning. After explaining this to the students, I'll have the students turn and talk to have them explain to each other what they learned.

Lunar Calendar

A lunar calendar is one based on the orbit of the moon. A lunar month (29.53 days) is slightly shorter than an average standard month. If you only had 12 lunar months, then you would end up around 12 days short of a year. As a result, very few modern societies use a lunar calendar or month. However, many ancient societies measure their time in lunar months or "moons."

Day 6

On Day 6, the students will be learning about one phase of the moon, along with what is waxing, and waning is. The first the students will be watching a video about the phases of moon are called ⁷“Phases of the Moon Rap”

New Moon – The students will learn that this is the beginning portion of the moon's phases. A new moon happens when the moon is located between the sun and the Earth. We typically cannot see a new moon since the dark side of the moon is facing the Earth. New moons can create a solar eclipse where the moon blocks the sun's rays and creates a shadow on parts of the Earth. Need to remind the students that this phase occurs a few days after a new moon. After I have talked about this, I will have the students get out their Sun, Earth, and the different moon pages. A whole group activity, we will fill in the whole moon for the new moon. When are finished, the students then will write on an exit ticket what they learned about new moon?

Day 7

On Day 7 - Waxing Crescent the students are going to learn about the waxing crescent of the moon. During the Waxing Crescent phase, the moon travels east in the sky to the west as the Earth rotates. The waxing crescent phase of the moon begins once we can see a tiny sliver of the moon after a new moon. There are times when you might be able to see the rest of the moon as well, even if it is dark because of a phenomenon called

“earthshine” in which the Earth reflects sunlight to the moon. You might say this like a thumb nail in the skill. Once the students were taught the lesson, they are going to turn talk about the lesson. With their partner they are going to read two pages of their ⁸Moon Book about the New Moon and Waxing Crescent. They are to describe what they learned about the New Moon and Waxing Crescent looks like.

Day 8

On Day 8 – The students will learn about the first quarter which is the next and the third phases. This is a whole group activity. During this phase happens when you can see half of the moon that is lit. The name “first quarter” comes from the fact that at this stage the lunar cycle is 1/4 of the way completed. Not everyone will see the same halves of the moon lit up during this phase, primarily because it depends on your location. So, some people may see the right half illuminated while others might see the left half illuminated. It will be in the same part of the moon lit, just that it may appear upside down. A whole group activity, we will fill in the three-fourth of the moon for the waxing crescent and half of the moon for the first quarter. As whole group activity, we will fill in the whole moon for the waxing crescent and first quarter. When are finished, the students then will write on an exit ticket on what the students learned about the first quarter of the moon?

Day 9

On Day 9 – The students will learn about the waxing gibbous. This phase essentially covers the time between the first quarter phase and the full moon phase. The words waxing gibbous describe what the phase is well. Waxing means growing larger, and the word gibbous refers to the shape, so waxing gibbous essentially means “growing shape”. The moon will get more and more illuminated until the moon is fully illuminated, which starts the next phase. This is where the moon is fully illuminated in the night sky or during the day time. If it is night, you can get good view of all the craters and the mountains. During the teaching of this activity the students will be looking different pictures of full moons. With their partner they are going to read two pages of their Moon Book on First Quarter and Waxing Gibbous. They are to describe what they learned about the First Quarter and Waxing Gibbous looks like.

Day 10

On Day 10 – Students will learn about, a full moon and this is when we see the entire moon face that is illuminated by the sun. Full moons occur when the sun and moon are on opposite sides of Earth. Technically the moon is only 100% illuminated by the sun for a few moments, but this phase also covers when the moon looks full but isn't. This is the half of the moon that we see all time.

When the moon is at its closest point to the Earth in its orbit it is called a supermoon, and at its farthest point, it is called a micro-moon. Another cool thing that occasionally happens during a full moon is when the moon passes through our Earth's shadow, called a lunar eclipse. During a lunar eclipse, the moon will be a reddish color. During this point of the lesson there will be pictures shown so the students can turn and talk about what they see during the micro-moon, supermoon, and lunar eclipse having a reddish color. By having the students turning to talk they will get what they are thinking. Once the lesson is finished and they students have time to process what they learned. As whole group activity, we will fill in the whole moon for the waxing gibbous and full moon. When are finished, the students then will write on an exit ticket on what the students learned about the waxing gibbous of the full moon?

Day 11

On Day 11 – Students will learn about the waning gibbous. Like we covered above, waxing means increasing and waning means decreasing. So, in this case, the waning gibbous moon means that the shape is decreasing. The waning gibbous phase lasts until the moon is half illuminated. The students will be showed pictures to help for understanding as we go along with the waning process. With their partner they are going to read two pages of their Moon book on the Full Moon and Waning Gibbous. They are to describe what they learned about the New Moon and Waxing Crescent looks like.

Day 12

On Day 12 – Students will learn about the Third Quarter. This phase is basically the exact opposite of the first quarter moon. This is when the moon is half lit up in the sky, and it also signals when the lunar phase is 3/4 of the way completed. The students are going to turn and talk about why they think the moon is getting small after the full. As whole group activity, we will fill in the whole moon for the waning gibbous and third quarter. When are finished, the students will then write on an exit ticket on what the students learned about the waning gibbous of the third quarter?

Day 13

On Day 13 – the students will learn about the waning crescent. This is the final stage of the lunar cycle. This phase starts when the sun illuminates less than half of the moon and continues until the New Moon phase. During this phase, we can also see the effect of “Earthshine”, just like we can during the new moon phase. This phase “ends” when the moon and the sun rise at the same time, which starts the lunar cycle over again starting with the new moon. With their partner they are going to read two pages of their Moon book on the Waning Crescent and New Moon. They are to describe what they learned about the Waning Crescent and New Moon looks like. If there is time: As whole group activity, we will fill in the whole moon for the waning crescent and new moon. When are

finished, the students then will write on an exit ticket on what the students learned about the waning crescent of the new moon?

Lesson Three: Oreo Cookie Moon Phases

Day 14

On Day 14 – The students will have a chance for a real hands-on activity. This will involve Oreo Cookies and ⁹Cookie Moon Phases Paper. Each student will need 8 Oreo cookies. I'll have an example already done so the students will have something to go by. They students will have they vocabulary cards that they can use to help with their activity.

Lesson Four: Visiting the moon

Day 15

On day 15, the students are going to watch a video from The National Geographic of the Apollo moon landing. Then will turn and talk about the video when it is finished. Have the students pair up with a partner to write down things that happened during the Apollo moon landing.

Day 16: Astronauts that visited the moon

On day 16, the students are going to learn about Neil Armstrong. Neil Armstrong was selected to be the first man to walk on the moon, as the Apollo 11 mission was planned, for several reasons: he was the commander of the mission, he didn't have a big ego, and the door of the lunar lander was on his side. Although the first steps on the moon are what he will always be known for, Armstrong considered the mission's biggest accomplishment was landing the lunar module. Another astronaut that walked on the moon with Neil Armstrong was Buzz Aldrin. Aldrin accompanied Neil Armstrong on the first moon landing in the Apollo 11 mission, becoming the second person, and now the first of the living astronauts, to set foot on the moon. Aldrin had taken a home Communion kit with him. The students will also read an article about ***Men Who Walked on the Moon*** as a class. Then they will be put with a partner to answer the questions.

Day 17

On day 17, the students are going to learn about two other astronauts that walked on the moon. Pete Conrad was a Princeton graduate and Navy test pilot before entering the astronaut corps in 1962. He flew on the Gemini V mission and was commander of Gemini XI. Conrad was commander of the Apollo 12 mission, launched during a lightning storm which temporarily knocked out the command module's power shortly

after liftoff. When Conrad stepped onto the moon, he said, Whoopee! Man, that may have been a small one for Neil, but that's a long one for me.

Alan Shepard was an American astronaut, naval aviator, test pilot, and businessman. In 1961 he became the first American to travel into space, and in 1971 he walked on the Moon. He became a naval aviator in 1946, and a test pilot in 1950. He became the second person, and the first American, to travel into space, and the first space traveler to manually control the orientation of his craft. Shepard commanded the Apollo 14 mission, piloting the Apollo Lunar Module Antares to the most accurate landing of the Apollo missions. At age 47, he became the fifth, the oldest, and the earliest-born person to walk on the Moon, and the only one of the Mercury Seven astronauts to do so. During the mission, he hit two golf balls on the lunar surface.

Lesson Five: Moon Properties

Day 18

Students will learn about that on the moon, there's no air to breathe, no breezes to make the flags planted there by the Apollo astronauts flutter. In fact, the layer is so thin that the blanket is only deemed to be almost an atmosphere. This thin layer above the lunar surface is technically known as an “exosphere”. In an exosphere, the gas molecules are so distanced that they never seem to collide. The dust and atmosphere can have serious consequences for astronauts planning to travel to the moon. Moondust stripped Apollo spacesuits threadbare. Understanding the material floating in the lunar atmosphere should help space exploration programs to design the next generation of spacesuits and lunar equipment. Oxygen does not exist on the moon. Have the students talk about why there might not be no air or atmosphere on the moon. When the astronauts visited the moon, how did they have to protect themselves is writing prompt that the students will have to answer.

Day 19

The students will have a writing prompt about if the moon could sustain life: What would the moon look like, would you go to visit or live on the moon, what would the Earth look like from the Moon. Long ago, Earth's moon may have had conditions in which life could arise. In fact, such conditions could have arisen on the moon during two different periods, each tens of millions of years long, the study suggests. The scientists are not saying that life ever existed on the moon — just that the conditions that make life as we know it possible seem to have been in place billions of years ago. at least some of those key conditions could have existed simultaneously on the moon. If liquid water and a significant atmosphere were present on the early moon for long periods of time, we think the lunar surface would have been at least transiently habitable.

Day 20

The students will learn about mission patches and design their own mission patch like they are going a mission to the moon. The students will write about their patch and explain what type of mission they are going on for NASA. Every mission that NASA ever had for manned mission there was a mission patch. The mission patches went along with what the mission represents. A mission patch is a cloth reproduction of a spaceflight mission emblem worn by astronauts and other personnel affiliated with that mission.

Day 21

On Day 21 the students will have an activity that will help them remember the phases of the moon. We are going to do the Moon Phases Ball/Lamp Activity. The sun will be the center of the room which is a lamp. Each student will have a stick and a Styrofoam ball as the moon attached. The students themselves are the Earth. The students will stand in a circle around the room. They will hold the stick with the Styrofoam ball as the moon in front of them. We will go over each phase of the moon on step at a time.

Appendix

Reading about the moon with the different phases will help students to ask and answer questions about key details about the moon phases, astronauts, and atmosphere.

Common Core State Standard for Literature CCRA.R.2 Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas. Students will read about moon phases in their moon phases books and the need to be able to get the key detail about each moon phase.

Reading about the different astronauts that have walked on the moon will help the students to ask questions of how and why those individuals went to the moon. **Common Core State Standard for Literature CCRA.R.3.** Analyze how and why individuals, events, or ideas develop and interact over the course of a text. Students will talk about the four astronauts that walked on the moon to determine how they are same and different. What were some of the different things that they did on the moon?

Students will need the skill of learning vocabulary words and building their knowledge on vocabulary words. **Common Core State Standard for Literature CCRA.R.4.** Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone. The different vocabulary words that in this lesson will help the students gain knowledge about the moon.

Students will be doing writing topic writing on events and facts that has happened on the moon. **Common Core State Standard for Literacy.W.1.2.** Write

informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure. There are many events that will be covered that they students will be able to write about. This will build on their ability to write on topics that have occurred during those events.

Space Systems: **Patterns and Cycles: 1- ESS1 - 1** Use observations of the sun, moon, and stars to describe patterns that can be predicted. **1 - ESS1 – 2** Make observations at different times of the year to relate the amount of daylight to the time of year.

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Endnotes

¹ Unknown. n.d. "Creation of the Moon." Space and Astronomy News. Space and Astronomy News.

² Olpem, Rebecca 2007. *Exploring the Moon - Objects in the Sky*. New York: Power Kids Press

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⁸ Smith, Kristen. 2014. My Moon Book Level Reader. Kristen Smith

⁹ Science, Bob, Oreo Cookie Moon Phase Activity, Sciencebob.com