Science Unit Overview

Student Name: Zeinab Abdullah

Grade Level: 6th

Science Concept: Earth Science: Space Systems

Anchoring Phenomena: Changes in the Moon

Lesson Plan 1	Lesson Plan 2	Lesson Plan 3
Why does the moon change in shape throughout the month?	**What causes a lunar eclipse?**	**What causes a solar Eclipse?**
Standard(s):	**Standard(s):**	**Standard(s):**
• MS-ESS1-1 Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.	• MS-ESS1-1 Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.	• MS-ESS1-1 Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons
Objective(s):	**Objective(s):**	**Objective(s):**
• Students will be able to investigate why the moon looks different on different days by looking at a moon phase stimulation. • Students will be able to explain the position of the sun, Moon and Earth at each phase by doing a class demonstration. • Students will be able to model the moon phases by using oreos.	• Students will be able to explain what causes a lunar eclipse. • Students will be able to model the position of the Sun, Earth and Moon in a lunar eclipse. • Students will be able to explain why lunar eclipses are more common.	• Students will be able to explain why solar eclipses occur. • Students will be able to describe the position of the Sun, Moon and Earth in a solar eclipse. • Students will be able to draw and construct a model of a solar eclipse. • Students will be able to explain why a solar eclipse is rare.
Best Practice/Additive:	**Best Practice/Additive:**	**Best Practice/Additive:**
• Moon phases Simulation https://sepuplhs.org/middle/third-edition/simulations/moon_phase_simulation.html. • Moon phases matching game	• Lunar Eclipse Simulation http://highered.mheducation.com/olcweb/cgi/pluginpop.cgi?it=swf::800::600::/sites/dl/free/0072482621/78778/Ecli	

https://matchthememory.com/BESLclass.	pses_Nav.swf::Eclipse%20Interactive	
Lesson Plan 4	**Lesson Plan 5**	**Lesson Plan 6**
What causes a supermoon?	**Why do we see the moon during the daytime?**	**What causes a moon halo?**
Standard(s):	**Standard(s):**	**Standard(s):**
• MS-ESS1-1 Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.	• MS-ESS1-1 Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.	• MS-ESS1-1 Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.
Objective(s):	**Objective(s):**	**Objective(s):**
• Students will be able to explain what causes a supermoon. • Students will be able to explain the difference between a perigee and an apogee. • Students will be able to draw the position of the Sun, Earth and Moon and label perigee and apogee. • Students will be able to measure a full moon over several months.	• Students will be able to explain why we are able to see a moon during the day. • Students will be able to draw diagrams showing why we see the moon during the day and at night.	• Students will be able to conduct research to figure out what causes a Moon halo. • Students will be able to present their findings about what causes a Moon halo to the class.
Best Practice/Additive:	**Best Practice/Additive:**	**Best Practice/Additive:**
• Kahoot https://create.kahoot.it/details/supermoon/935b7f12-7b5e-4038-b185-9445fd783253.	Simulation https://pbslm-contrib.s3.amazonaws.com/WGBH/buac19/buac19-int-earthsunmoon35model/index.html Simulation packet https://view.officeapps.live.com/op/view.aspx?src=https://d43fweuh3sg51.cloudfront.net/media/media_files/cedef81d-b17f-4d94-8fdf-a24517fca3c3/6ba482c9-f33c-49cd-90aa-778f1b5eb4e7.docx.	

Cross Cutting Concepts (CCC):

Patterns: Students are looking at patterns of the moon. Each month we see a new moon, waxing crescent, first quarter, waxing gibbous, full moon, waning gibbous, last quarter and waning crescent. The moon phases always happen in this order. The pattern repeats every month.

Cause and Effect: Students will learn that the position of the Sun, Earth and moon cause a lunar eclipse. The Earth blocking the Moon causes a lunar eclipse.

Cause and Effect: Students will learn that the position of the Sun, Moon and Earth cause a solar eclipse. The Moon blocks the sun causing a solar eclipse in certain locations on Earth.

Cause and Effect: Students will learn that the distance between the earth and the moon causes a supermoon. When the moon is closer to earth we see a supermoon.

Scale, proportion, and quantity: Students will be measuring a full moon for several months to record size changes in the full moon.

Patterns: Students will be looking at moon patterns to determine why we see the moon during the daytime.

Cause and Effect: What causes a moon halo is the moonlight passes through thin ice crystals which are found in high cirrus clouds. Clouds contain millions of ice crystals. When the moon shines it refracts or bends off those ice crystals and it creates that halo around the moon or sun.

Science and Engineering Practices:

Asking questions and defining problems: Through the first lesson students are asking “Why are there moon phases?” “What causes the moon to change shape throughout the month?”

Developing and using models: The students will draw pictures of the sun, Earth and moon phases. Then they will use the drawings to do the oreo moon phase activity.

Planning and Carrying out Investigation: After looking at the simulation of the phases of the moon , students are planning and carrying out an investigation to answer the question “Why are there moon phases?” Students will use a lamp to represent the sun, styrofoam ball to represent the moon and their head to represent the Earth.

Asking questions and defining problems: Students will ask questions about a lunar eclipse. An example of a question is “What causes a lunar eclipse?” and then through investigation they will answer those questions.

Developing and using models: Students will draw pictures of a lunar eclipse. They will draw the position of the Sun, Earth and Moon. They will also create a model of a lunar eclipse.

Planning and Carrying out Investigation: Students will look at the lunar eclipse interactive. They will use a flashlight, two styrofoam balls, wooden skewers and playdough to investigate what causes a lunar eclipse and how it looks.

Planning and Carrying out Investigation: Students will investigate what causes a solar eclipse. The students will use clay balls, toothpicks, binder clips and meter sticks to carry out an investigation outside in a sunny area.

Developing and using models: Students will draw a diagram of a solar eclipse. They will draw the position of the Sun, Moon and Earth and label the different shadows.

Obtaining, evaluating and communicating information: Students will be investigating, reading articles and presenting their findings to the class about solar eclipses.

Developing and using models: Students will draw a diagram of a supermoon. They will draw the position of the Sun, Moon and Earth and label the perigee and apogee.

Obtaining, evaluating and communicating information: Students will complete a webquest worksheet to investigate what causes a supermoon. Then they will present their findings to the class.

Developing and using models: Students will draw a diagram explaining why we see the moon during the daytime. They will draw the position of the Sun, Moon and Earth.

Obtaining, evaluating and communicating information: Students will look at a simulation to answer the question "Why do we see the moon during the daytime?" They will complete a packet and share their findings with their classmates.

Developing and using models: Students will be drawing a diagram representing what causes a moon halo. Their drawing will show that when the moon shines it refracts or bends off ice crystals found in clouds and it creates that halo around the moon or sun.

Obtaining, evaluating and communicating information: Students will be looking at diagrams and reading articles to figure out what causes a moon halo. They will be creating a PowerPoint presentation and sharing their findings with their classmates.

Lesson Plan 1 - Why does the moon change in shape?

EDD 485 - Teaching Science in the Elementary/Middle School Grades - University of Michigan - Dearborn

Narrative / Teacher Background Information

Name: Zeinab Abdullah

Grade Level: 6th

Concept: Earth Science: Space system

Phenomenon: Moon phases (Why does the moon change in shape?)

Extra Lesson Additive: Moon phases simulations
https://sepuplhs.org/middle/third-edition/simulations/moon_phase_simulation.html.
Moon phases matching game
https://matchthememory.com/BESLclass.

Michigan Science Standards:

- MS-ESS1-1 Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.

Objective(s):

- Students will be able to investigate why the moon looks different on different days by looking at a moon phase simulation.
- Students will be able to explain the position of the sun, Moon and Earth at each phase by doing a class demonstration.
- Students will be able to model the moon phases by using oreos.

Students - Prior Knowledge:

- To assess students' background knowledge, I will have the students take out their science journal and write everything they know about the moon.
- Students might already have learned that the moon orbits around the Earth.
- Students might have already observed that the moon changes in shape throughout the month.

Students - Possible Misconceptions:

- Students might think that the moon has its own light.
- Students might not know that the moon orbits around the Earth instead of the Sun.
- Students might think that the moon orbits around the Earth in one day.
- Students might think that clouds cause the phases of the moon.

Lesson Vocabulary

- **Pattern**: A pattern is something that repeats over and over again.
- **Orbits:** "An orbit is the path of an object around a particular point in space, for example the path the moon takes around the Earth" (esa kids).
- **Phase:** The shape of the moon we see each day.
- **Waxing:** When the moon is getting bigger each day.
- **Waning:** When the moon is getting smaller each day.
- **Crescent:** less than half a moon is illuminated, but larger than the new moon.
- **Gibbous:** More than half is illuminated, but smaller than a full moon.

Lesson Materials

- Moon Journal https://www.jpl.nasa.gov/edu/pdfs/moonjournal_worksheet.pdf
- Lamp with shade removed
- Styrofoam ball
- Pencil
- Oreos
- Plastic knife
- Moon Phase worksheet https://www.pinterest.com/pin/200269514658325841/
- Chromebooks
- Promethean board
- Phases of the moon rap https://www.youtube.com/watch?v=79M2lSVZiY4
- Moon phase simulation *https://sepuplhs.org/middle/third-edition/simulations/moon_phase_simulation.html*
- White Board
- Moon phases video https://www.youtube.com/watch?v=wz01pTvuMa0&t=46s.
- Moon phases matching game
- https://matchthememory.com/BESLclass.

Safety Concerns/Materials Guidelines/Cleanup Procedures

Safety Concerns:

- Students will be using a plastic knife to shape the oreo cream into the moon phases. I will explain to the students to not point the plastic knife at each other, to not run with it and to place it on the table when they are not using it.
- Students will physically demonstrate the phases of the moon. They will slowly spin around to represent the Earth and moon revolving. The area should be clear, so no one trips on anything.
- We will be using a lamp with the shade removed to represent the sun, so I will explain not to touch the light bulb because it gets hot.

Materials Guidelines:

- Physical demonstration of the moon phases: https://www.youtube.com/watch?v=wz01pTvuMa0&t=46s.
    - Turn off the light and close the shades, so the room can be dark.
    - Turn on the lamp.
    - Take the pencil and stick it into the styrofoam ball.
    - The styrofoam ball represents the moon, the student's head represents the earth and the lightbulb represents the sun.

    - The student will hold the styrofoam ball out and spin slowly to see which part of the moon is illuminated.
- Oreo moon phases
    - Students will get oreo cookies and a moon phase worksheet.
    - Students will twist eight cookies apart and take the plastic knife to carve the cookie cream, so it looks like the moon phases.
    - Students will then place the cookies inside the circles on the moon phases worksheet in the correct order.
    - The teacher will then take a picture of the moon phases worksheet.

Cleanup Procedures:

- Students will put away the chromebooks.
- Students will throw the oreo cookies that touched the table or fell to the floor. They will wipe the table.
- Students will throw the plastic knives.
- Students will put away the lamp, put the pencils back where they belong and place the styrofoam balls into a box, so they can reuse them for another unit.

Technology Incorporated

- The teacher will show a moon phase rap song on the promethean board.
- Students will use chromebooks to look at the moon phases simulation.

Engage - Assess Prior Knowledge/Current Thinking/Framing the Unit

I will begin by asking students “What are some things you see in the sky at night?” I will write the student's responses on the board. Two examples are stars and the moon. Then I will continue to ask “What do you notice about the moon throughout the month?” Students will write their answers in their journals and then share with the class. I will ask students to write everything they know about the moon in their science journal. This will help me as a teacher to assess the students’ background knowledge. To get the students excited about the lesson, I will play the phases of the moon rap song by Mr. Lee. The song has lyrics, so the students can sing along. https://www.youtube.com/watch?v=79M2lSVZiY4.

Explore

Students: Students will each get a chromebook and go to the website ***https://sepuplhs.org/middle/third-edition/simulations/moon_phase_simulation.html.*** This website allows the students to see the moon orbiting around the Earth. When students press on play, they can observe the position of the Sun, Moon and Earth. If students want to see a specific moon phase, they have the option to select it and observe its position in relation to the Sun and Earth. Students will draw and label the Sun, Earth and moon phases, then they will be grouped into five groups. Each group will receive a lamp with the shade removed, a pencil and a styrofoam ball. They will investigate what they saw in the simulation. The lamp represents the sun, the styrofoam ball represents the moon and the student’s head represents the Earth. Students will hold the moon out and spin to see which part is illuminated by the Sun and which part of the moon is visible to us on Earth. Students will draw their observations on a white board. https://www.youtube.com/watch?v=wz01pTvuMa0&t=46s.

Teacher: I will walk around to listen and observe how the students are interacting with each other. I will ask questions such as “How much of the moon is always lit up by the sun?” and “How much of the lit up part of the

moon can we see from Earth?" This will help students make sense of what they are looking at. The students are doing the exploration and I'm there to guide them.

Explain

Students: Each group will present their observations written on the whiteboard. They will show their drawing and then explain the position of the Sun, Moon and Earth, how much of the moon is always lit up, which part of the lit portion can we see from Earth and which moon phase does each represent. Each group will present a summary of their findings.
Teacher: I will go over the lesson vocabulary, so students can finally connect everything together. I will emphasize important ideas that the students presented. I will explain again that half of the moon is always illuminated by the sun and that on Earth we don't always see the lighted half of the moon. We see fractions of the lighted half and that's why we have moon phases.

Elaborate/Extend

Students: Students will now do a fun activity where they will use oreo cookies to represent each moon phase. They will twist eight cookies and use a plastic knife to carve the cookie cream into the moon phases. Students will label and explain each phase.

Evaluate

Formative Assessment:

- I will go around and take pictures of the students' oreo activity and check if students were able to model and explain the moon phases. Students will also be given a moon journal. They will need to check and draw the moon everyday. I will check the journal weekly to see if students are able to draw and recognize the moon phases. Students will also play a moon phase matching game.

References

Atkinson, R (2015). "Moon Phases." *SlidePlayer.* Retrieved from https://slideplayer.com/slide/7421905/.
Different Orbits. *Esa kids*. Retrieved from https://www.esa.int/kids/en/learn/Technology/Mission_control/Different_orbits.

"Moon Journal" [worksheet]. *Jet Propulsion Laboratory California Institute of Technology.* Retrieved from https://www.jpl.nasa.gov/edu/pdfs/moonjournal_worksheet.pdf.

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National Science Teaching Association (2014). Moon Phases Demonstration [video]. *Youtube.* Retrieved from https://www.youtube.com/watch?v=wz01pTvuMa0&t=46s.

"Phases of the Moon with Oreo Cookies." *Pinterest.* Retrieved from https://www.pinterest.com/pin/200269514658325841/.

The Moon Orbit. Retrieved from https://sepuplhs.org/middle/third-edition/simulations/moon_phase_simulation.html.

Lesson Plan 2 - What Causes a Lunar Eclipse?

EDD 485 - Teaching Science in the Elementary/Middle School Grades - University of Michigan - Dearborn

Narrative / Teacher Background Information

Name: Zeinab Abdullah

Grade Level: 6th

Concept: Earth Science: Space System

Phenomenon: Lunar eclipse (What causes a lunar eclipse?)

Extra Lesson Additive:
http://highered.mheducation.com/olcweb/cgi/pluginpop.cgi?it=swf::800::600::/sites/dl/free/0072482621/78778/Eclipses_Nav.swf::Eclipse%20Interactive**.**

Michigan Science Standards:

- MS-ESS1-1 Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.

Objective(s):

- Students will be able to explain what causes a lunar eclipse.
- Students will be able to model the position of the Sun, Earth and Moon in a lunar eclipse.
- Students will be able to explain why lunar eclipses are more common.

Students - Prior Knowledge:

- Prior to this lesson students learned about the phases of the moon. To check how much information they retained, students will go to https://starchild.gsfc.nasa.gov/docs/StarChild/solar_system_level2/moonlight.html. They will label the moon phases and put them in order. They have the option to check their answer at the end.
- Students might have already heard about lunar eclipses.
- Students should be able to explain that we see changes in the moon due to the position of the Sun, Earth and Moon. The Earth orbits around the sun and the moon orbits around the Earth.
- From the previous lesson students should be able to explain that it takes the moon about a month to orbit around the Earth.

Students - Possible Misconceptions:

- Students might think that lunar eclipses are dangerous to view without eye protection.
- Students might think that lunar eclipses happen every month.
- Students might think that lunar and solar eclipses are the same.
- Students might think that they should not go out when there is a lunar eclipse.

Lesson Vocabulary

- **Lunar:** Things that have to do with the moon.
- **Eclipse:** When one object blocks another from view.

- **Lunar Eclipse:** When the Earth is directly between the Moon and the Sun.
- **Partial lunar eclipse:** The Moon is partially in the Earth's umbral shadow and partially in the penumbral shadow.
- **Total lunar eclipse:** The Moon is in the Earth's umbral shadow. The Moon appears to be red in color.
- **Penumbra:** "Lighter part (of shadow) surrounding the umbra.
- **Umbra:** Darkest part of the shadow.

Lesson Materials

- Science Journals
- Flashlight
- Large and small styrofoam balls
- Playdough
- Two wooden skewers
- Tape
- Promethean board
- Chromebooks
- Live worksheet https://www.liveworksheets.com/kf181798vg.
- Labeling worksheet https://www.enchantedlearning.com/subjects/astronomy/activities/label/lunareclipse/
- Lunar eclipse introduction video https://www.youtube.com/watch?v=CtOWKIduGKo
- Lunar eclipse simulation http://highered.mheducation.com/olcweb/cgi/pluginpop.cgi?it=swf::800::600::/sites/dl/free/0072482621/78778/Eclipses_Nav.swf::Eclipse%20Interactive
- Craft worksheet https://blogs.nasa.gov/NES_Teachers_Corner/2011/04/20/post_1303308712680/
- Craft video https://www.pinterest.com/pin/611574824379425743/
- Scissors
- Paper fastener
- Markers/color pencils
- White board

Safety Concerns/Materials Guidelines/Cleanup Procedures

Safety Concerns:

- Students will be using wooden skewers, so I will explain to students not to run with them or point them at anyone. Instead of inserting the wooden skewers into the styrofoam balls, students will tape them so they don't get injured.
- Students will be also using scissors. So, they must hold the blade down when walking with scissors.
- Students will be using paper fasteners. I will explain to students to not put them in their mouth because they can choke.

Materials Guidelines:

- Demonstration of lunar eclipse https://www.youtube.com/watch?v=FbPgrEOJhdM&t=186s.
    - Use markers to color the two styrofoam balls to represent the Earth and Moon.
    - Take the wooden skewers and tape one on Earth and another one on the Moon.
    - Stick the wooden skewers in the playdough to support the Earth and Moon.
    - Turn off the class light and turn on the flashlight.
- Lunar Eclipse craft https://blogs.nasa.gov/NES_Teachers_Corner/2011/04/20/post_1303308712680/, https://www.pinterest.com/pin/611574824379425743/.
    - Color the Earth, Moon and Sun.
    - Cut out the patterns.
    - Connect the Earth to the Sun using a brad or paper fastener on the circle.

- Connect the Moon to Earth using a brad or paper fastener on the square shape.
- Show the movement of Earth and Moon by moving the Earth around the Sun and the Moon around the Earth.

Cleanup Procedures:

- Students will put away the chromebooks when they complete the simulation activity.
- Students will return scissors, markers and colored pencils where they belong.
- Students will display their lunar eclipse models.
- Students will recycle scrap papers that they no longer need.

Technology Incorporated

- The teacher will show lunar eclipse videos using the promethean board.
- Students will use chromebooks to look at the lunar eclipse simulation and complete the live worksheet.

Engage - Assess Prior Knowledge/Current Thinking/Framing the Unit

To assess students' background knowledge about lunar eclipses I will ask students "Have you ever seen a red moon?" I will call on students to answer. Then I will ask "What do you think a lunar eclipse is and what causes it?" Students will write their predictions with some questions they have in their science journals. Students will share what they wrote. After the students share their answers, I will show the "Total Lunar Eclipse" video. This video shows how a lunar eclipse looks like. I will use it to capture and trigger students' interest. https://www.youtube.com/watch?v=CtOWKIduGKo.

Explore

Students: Simulations help students visualize what's happening in outer space. Students will begin by looking at a simulation of a lunar eclipse. Students will go to http://highered.mheducation.com/olcweb/cgi/pluginpop.cgi?it=swf::800::600::/sites/dl/free/0072482621/78778/Eclipses_Nav.swf::Eclipse%20Interactive. This website allows students to compare a lunar eclipse with a solar eclipse. But for this lesson, students will only look at the lunar eclipse simulation. They will draw the position of the Sun, Earth and Moon in a lunar eclipse on their white board. After that students will work with their table to test what they saw in the simulation. They will receive a flashlight to represent the Sun, a large styrofoam ball to represent the Earth, a small ball to represent the Moon, playdough and two wooden skewers or straws. The students will color the large and small ball to look like the Earth and Moon. Then they will tape one wooden skewer to the Earth and another one to the Moon. Students will then stick the wooden skewers in the playdough to support the Earth and Moon. We will turn off the light and turn on the flashlight and students will move the Moon around the sun to see how in a lunar eclipse, the Sun, Earth and Moon are in a straight line. They will learn that the Earth is blocking the Moon.
https://www.youtube.com/watch?v=FbPgrEOJhdM&t=186s.
Teacher: My job as a teacher is to guide the students. I will walk around to help them set up for the exploration if they are struggling. I will ask "Based on this exploration, what causes a lunar eclipse?" I will listen to students' answers to check if students are understanding the phenomenon of lunar eclipse.

Explain

Students: In the engage portion students wrote their prediction on what is a lunar eclipse. Now that they completed the exploration, students will go back and revise their predictions. They will write a paragraph explaining what causes a lunar eclipse. They will also draw a picture to go along with it. After that students will share with the class what was their prediction, the scientific answer and the picture they drew.

Teacher: I will go over the vocabulary. Now that the students have done the exploration, I will teach a mini lesson about the phenomenon. I will explain that a lunar eclipse occurs when the Earth moves between the Sun and the Moon. The Earth blocks the Sun's sunlight from reaching the moon. There's a partial and total lunar eclipse. A partial lunar eclipse is the moon is partially in the Earth's umbral shadow and partially in the penumbral shadow. A total lunar eclipse is the moon is in the Earth's umbral shadow. The reason we see a reddish color is because "Earth's atmosphere absorbs the other colors while it bends some sunlight toward the moon" (NASA Science Space Place Explore Earth and Space). We don't see a lunar eclipse every month because the moon's orbit around Earth is at a tilt. Good sources that explain a lunar eclipse: https://spaceplace.nasa.gov/eclipses/en/ and https://www.youtube.com/watch?v=LH-aSizsx1o&t=87s.

Elaborate/Extend

Students: The students will complete a Sun, Earth and Moon craft. They will get a worksheet. The directions in the worksheet are:

1. Color the Earth, Moon and Sun.
2. Cut out the patterns.
3. Connect the Earth to the Sun using a brad or paper fastener on the circle.
4. Connect the Moon to Earth using a brad or paper fastener on the square shape.
5. Show the movement of Earth and Moon by moving the Earth around the Sun and the Moon around the Earth.

To represent a lunar eclipse students will line up the Sun, then the Earth and then the Moon in a straight line. This activity could be used for the solar eclipse lesson as well.
https://blogs.nasa.gov/NES_Teachers_Corner/2011/04/20/post_1303308712680/
https://www.pinterest.com/pin/611574824379425743/.

Evaluate

Formative Assessment:

- To evaluate students I will have them go to LIVEWORKSHEETS. The live worksheet has questions on both solar and lunar eclipses. Students will only complete the section on the lunar eclipse. Students will get their scores right away, so I will record the score. Then students will get another worksheet where they will need to label the Earth, Moon, Sun, penumbra and umbra. I will collect the worksheet to check for understanding. If students are struggling I will go back and explain the concepts they don't understand.
- https://www.liveworksheets.com/kf181798vg.
- https://www.enchantedlearning.com/subjects/astronomy/activities/label/lunareclipse/.

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Lesson Plan 3 - What Causes a Solar Eclipse?

EDD 485 - Teaching Science in the Elementary/Middle School Grades - University of Michigan - Dearborn

Narrative / Teacher Background Information

Name: Zeinab Abdullah

Grade Level: 6th

Concept: Earth Science: Space System

Phenomenon: Solar Eclipse (What causes a solar eclipse?)

Extra Lesson Additive:

Michigan Science Standards:

- MS-ESS1-1 Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.

Objective(s):

- Students will be able to explain why solar eclipses occur.
- Students will be able to describe the position of the Sun, Moon and Earth in a solar eclipse.
- Students will be able to draw and construct a model of a solar eclipse.
- Students will be able to explain why a solar eclipse is rare.

Students - Prior Knowledge:

- Students already learned about what causes the moon phases and lunar eclipses.
- Students learned in the previous lessons that the position of the Sun, Earth and Moon cause the changes in the shape of the Moon.
- Students learned in the previous lesson that an eclipse is when one object blocks another from view.
- Students might already know that people need to wear proper eye protection when looking at a solar eclipse.

Students - Possible Misconceptions:

- Everyone on Earth can see a solar eclipse when it occurs.
- A solar eclipse happens every month.
- You can look at a solar eclipse without eye protection.
- Solar eclipses are dangerous, so people should not go out when there's a solar eclipse.
- Solar eclipses last for the whole day.
- Solar eclipses are the same as lunar eclipses.

Lesson Vocabulary

- **Solar:** of or related to the sun.
- **Partial solar eclipse:** A portion of the sun is blocked by the moon.
- **Total solar eclipse:** The sun is covered completely by the moon.
- **Penumbra:** "Lighter part (of shadow) surrounding the umbra.

- **Umbra:** Darkest part of the shadow.
- **Path of totality:** This path is where a total eclipse can be visible.
- **Corona:** The outer layer of the sun. We can only see it during a solar eclipse.
- https://quizlet.com/218765890/6th-grade-science-solar-eclipse-flash-cards/

Lesson Materials

- Science journal
- Clay
- Toothpicks
- Meter sticks
- Binder clips
- "2017 Total Solar Eclipse- Greenville, SC" Youtube video https://www.youtube.com/watch?v=ZWQdmz7_mM8
- Solar eclipse outside exploration activity https://www.generationgenius.com/activities/solar-eclipse-model-diy/?gclid=CjwKCAjw0On8BRAgEiwAincsHI1cSLdGY5nmsxVKFnIQumu8poXqBpGSQEcsP0M6sK07RANr_t-3WRoCC74QAvD_BwE
- White board
- Promethean board
- Computer
- "Lunar and Solar Eclipses article by Ducksters Education website https://www.ducksters.com/science/physics/lunar_and_solar_eclipses.php#:~:text=A%20solar%20eclipse%20occurs%20when,the%20Sun%20has%20gone%20dark.
- Solar Eclipse webquest worksheet made by www.boone.k12.ky.us
- Kahoot game

Safety Concerns/Materials Guidelines/Cleanup Procedures

Safety Concerns:

- Students will be using toothpicks which are sharp. I will explain to students to not point them at each other and be careful not to hurt themselves with the toothpicks.
- Students will be using meter sticks, so I will explain to students not to hit each other with them.
- Students will be going outside, so I will keep an eye on them to make sure they don't leave.

Materials Guidelines:

- Solar Eclipse exploration activity
    - Each group will receive a meter stick, clay, three toothpicks and two binder clips.
    - The students will use the clay to make a 3.5 cm clay ball to represent the Earth and a 1 cm clay ball to represent the Moon.
    - Students will attach one binder clip to the 1cm mark and the other binder clip to the 100cm mark.
    - Next, students will stick one toothpick in the large ball (Earth) and another one in the small ball (Moon). Attach the large ball in the starting of the meter stick to represent the Earth and attach the small ball to the end of the meter stick to represent the Moon.
    - Go outside and tilt the meter stick to represent lunar and solar eclipses.

Cleanup Procedures:

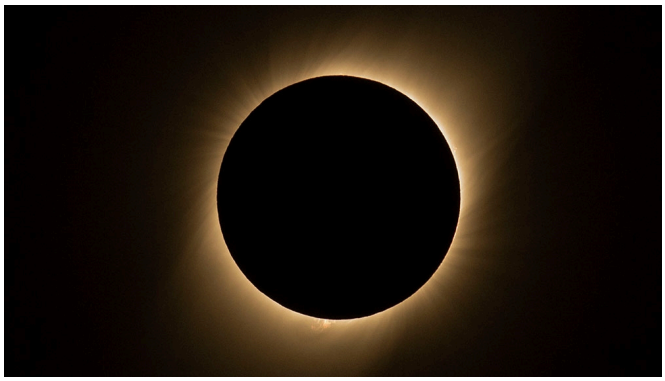
- Return the chromebooks to the cart.
- Put the clay back in the container.
- Return the meter sticks where they belong.
- Return the binder clips and throw away the toothpicks.

Technology Incorporated

- Promethean board to show the Youtube videos.
- Phones or computers to play kahoot and complete the webquest worksheet.

Engage - Assess Prior Knowledge/Current Thinking/Framing the Unit

To assess students' prior knowledge, I will begin by showing students a picture of a solar eclipse. I will ask them "What do you think is happening in this picture?, "What is the picture showing?" and "Based on what we learned in the previous lesson about lunar eclipses, what do you think is the position of the sun, earth and moon to cause what you see in the picture?" We will discuss their prediction as a class and then I will explain to them that our lesson will be about solar eclipses. After that I will show them the "2017 Total Solar Eclipse- Greenville, SC" Youtube video to get them excited about the lesson. I will ask the students "Why are the people excited to see a solar eclipse and what do you notice they are wearing while looking at the sky?" I will pick on volunteers to answer these questions.



https://www.youtube.com/watch?v=ZWQdmz7_mM8

Explore

Students: To explore what causes a solar eclipse, I will first divide the class into four groups. Each group will receive a meter stick, clay, three toothpicks and two binder clips. The students will use the clay to make a 3.5 cm clay ball to represent the Earth and a 1 cm clay ball to represent the Moon. Students will attach one binder clip to the 1cm mark and the other binder clip to the 100cm mark. The distance between the binder clips represent the 239,000 mile distance between the Earth and the Moon. Next, students will stick one toothpick in the large ball (Earth) and another one in the small ball (Moon). Attach the large ball in the starting of the meter stick to represent the Earth and attach the small ball to the end of the meter stick to represent the Moon. Students will go outside and simulate both a lunar and a solar eclipse. To represent a lunar eclipse students will tilt the Moon down and the Earth up. The students will see that in a lunar eclipse the earth blocks the sun. Then they will tilt the large ball down and the small ball up to represent a solar eclipse. Students will observe that in a lunar eclipse the Earth shadow is larger, so it covers the whole Moon. But, in a solar eclipse the Moon's shadow is small, so it can only be seen in a certain part of Earth. Students will draw the position of the sun, earth and moon in a lunar and solar eclipse on a white board.
https://www.generationgenius.com/activities/solar-eclipse-model-diy/?gclid=CjwKCAjw0On8BRAgEiwAincsHI1cSLdGY5nmsxVKFnIQumu8poXqBpGSQEcsP0M6sK07RANr_t-3WRoCC74QAvD_BwE
Teacher: I will walk around to check students' understanding. I will ask students questions such as "What do you notice about the shadow of the Earth on the Moon compared to the shadow of the Moon on the Earth?" The Earth shadow is much larger because the Earth is larger than the Moon. I will guide the students throughout the activity.

Explain

Students: After doing the activity students will go inside and draw a picture of a solar eclipse in their journals. The students will draw that in a solar eclipse the moon is in between the sun and the earth. They will write a paragraph explaining what causes a solar eclipse. Then they will go back to their groups and share their answers. The groups will explain the diagram they drew to the whole class.
Teacher: I will begin by explaining the vocabulary for this lesson. Students should be familiar with the terms penumbra and umbra because we discussed them in the previous lesson. I will explain that in a partial solar eclipse only a portion of the sun is blocked by the Moon. In a total solar eclipse the sun is covered completely by the Moon. I will explain to the class that a solar eclipse occurs when the Moon passes in front of the Sun. This causes a shadow on a certain part of Earth. This is the reason why we don't see a solar eclipse in every part of Earth. The solar eclipse only happens in the locations where the shadow falls. When a solar eclipse occurs the sun goes dark. I will explain that people should not look directly at a solar eclipse because it could damage their eyes. They should wear proper eye protection.
https://www.ducksters.com/science/physics/lunar_and_solar_eclipses.php#:~:text=A%20solar%20eclipse%20occurs%20when,the%20Sun%20has%20gone%20dark.

Elaborate/Extend

Students: Students will receive a solar eclipse Webquest worksheet. Students will go to the website http://www.mreclipse.com/Special/SEprimer.html to help them answer the questions in the worksheet. This worksheet is made by www.boone.k12.ky.us.

SOLAR ECLIPSE

-Starting Points: Visit this website-Solar Eclipses for Beginners:
http://www.MrEclipse.com/Special/SEprimer.html

Question #1.
What is the only lunar phase in which a solar eclipse can occur?
Question #2
Sketch the moon, sun and earth during a **solar** eclipse:
Question #3.
What are the three different kinds of solar eclipses?
Question #4.
Why don't we see a solar eclipse during every new moon?
Question #5.
How long does the total phase of a total solar eclipse last?
Question #6.
The path of the Moon's shadow across the Earth's surface is called …?
Question #7.
What are the key differences between total and annular eclipses?
Conclusion : Compare and contrast: What are at least 3 similarities and 3 differences between a lunar eclipse and a solar eclipse? During what phases of the moon do a solar and lunar eclipse occur?

Evaluate

Formative Assessment:

- To evaluate students, I will begin by checking their answers to the solar eclipse webquest worksheet. I will walk around and ask students questions to assess their understanding. We will also play a kahoot game to test students' knowledge on solar and lunar eclipses. https://play.kahoot.it/v2/gameover?quizId=efd2c31b-e306-4fd1-b7ff-79ecd7c02b4f.

References

D.I.Y With Adam. “Solar & Lunar Eclipses Activity for Kids” [video]. Retrieved from https://www.generationgenius.com/activities/solar-eclipse-model-diy/?gclid=CjwKCAjw0On8BRAgEiwAincsHI1cSLdGY5nmsxVKFnIQumu8poXqBpGSQEcsP0M6sK07RANr_t-3WRoCC74QAvD_BwE.

Eclipses Kahoot retrieved from https://play.kahoot.it/v2/gameover?quizId=efd2c31b-e306-4fd1-b7ff-79ecd7c02b4f

Espenak, F (2014). “Solar Eclipses for Beginners.” *MrEclipse.com.* Retrieved from http://www.mreclipse.com/Special/SEprimer.html.

“Lunar and Solar Eclipses.” *Ducksters Education Site.* Retrieved from https://www.ducksters.com/science/physics/lunar_and_solar_eclipses.php#:~:text=A%20solar%20eclipse%20occurs%20when,the%20Sun%20has%20gone%20dark.

Solar eclipse webquest worksheet made by www.boone.k12.ky.us.

Sun, M (2017). “2017 Total Solar Eclipse- Greenville, SC” [video]. *Youtube*. Retrieved from https://www.youtube.com/watch?v=ZWQdmz7_mM8.

Lesson Plan 4 - What causes a supermoon?

EDD 485 - Teaching Science in the Elementary/Middle School Grades - University of Michigan - Dearborn

Narrative / Teacher Background Information

Name: Zeinab Abdullah

Grade Level: 6th

Concept: Earth Science: Space System

Phenomenon: Supermoon (What causes a supermoon?)

Extra Lesson Additive: Kahoot
https://create.kahoot.it/details/supermoon/935b7f12-7b5e-4038-b185-9445fd783253.

Michigan Science Standards:

- MS-ESS1-1 Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.

Objective(s):

- Students will be able to explain what causes a supermoon.
- Students will be able to explain the difference between a perigee and an apogee.
- Students will be able to draw the position of the Sun, Earth and Moon and label perigee and apogee.
- Students will be able to measure a full moon.

Students - Prior Knowledge:

- Students already learned about the Moon phases, lunar eclipses and solar eclipses.
- Students know that we see changes in the shape of the moon because of the position of the sun, earth and moon.
- Students might already know that a supermoon is when the moon looks larger than normal.
- Students might have already observed a supermoon.

Students - Possible Misconceptions:

- Supermoons cause natural disasters.
- Supermoons happen every month when there is a full moon.
- Supermoon affects people's mood.

Lesson Vocabulary

- **Supermoon:** A supermoon is when a full moon looks larger by 14% and brighter by 30%.
- **Orbit:** "An orbit is the path of an object around a particular point in space, for example the path the moon takes around the Earth" (esa kids).
- **Apogee:** A full moon is its furthest distance from Earth.
- **Perigee:** A full moon is its closest distance to Earth.
- **Perigee syzygy:** The scientific name for supermoon.

Lesson Materials

- "Supermoon: What is it and How Often Does it Occur?" video https://www.youtube.com/watch?v=8DJc7p1WDSE.
- "What's a Supermoon and Just How Super is it?" article for webquest https://www.jpl.nasa.gov/edu/news/2017/11/15/whats-a-supermoon-and-just-how-super-is-it/.
- Full Moon Measuring procedures https://www.jpl.nasa.gov/edu/teach/activity/measuring-the-supermoon/#analog.
- Webquest questions
- Lamp with shade
- Pencils
- Styrofoam ball
- "What is a Supermoon?" video https://www.youtube.com/watch?v=lhKMQIRdaeo.
- Computer paper
- Clipboard
- Kahoot https://create.kahoot.it/details/supermoon/935b7f12-7b5e-4038-b185-9445fd783253.
- Promethean board
- Chromebooks
- Science Journals

Safety Concerns/Materials Guidelines/Cleanup Procedures

Safety Concerns:

- Students will be spinning around to represent the Moon's orbit, so students will remove objects near them so they don't fall down.
- Students will be using a lamp without a shade so I will explain to them not to touch the lightbulb because it's hot.
- Students will be using wooden skewers or pencils to hold the moon, so I will explain not to point them at others.

Materials Guidelines:

- Demonstration of a supermoon:
  - Lamp without shade to represent the sun.
  - Styrofoam balls will represent the moon.
  - Students will stick a pencil or wooden skewers to the moon so they can hold it.
- Measuring full moon: https://www.jpl.nasa.gov/edu/teach/activity/measuring-the-supermoon/#analog.
  - "Make note of where the full Moon is in the sky. Students can use stationary objects (buildings, trees, power poles, etc.) to find its relative location, or measure the Moon's location using altitude (vertical position) and azimuth (horizontal position)" (NASA: Jet propulsion Laboratory California institute of Technology).
  - Take a computer paper and line it up with the edge of a clipboard. Tape it so it does not move.
  - Hold the paper one to two feet from your face. Make sure you use the same distance every time you measure a full moon.
  - Line up the edge of the paper with the moon.
  - Draw lines where the top and bottom of the moon intersect with the paper. Measure the distance between the two lines in millimeters and write it down on a chart.

Cleanup Procedures:

- Students will return the chromebooks to the cart.
- Students will put back the pencils,and styrofoam balls back where they belong.

- Students will turn off the lamp and put it away.

Technology Incorporated

- Promethean board to show the Youtube videos.
- Phones or computers to play kahoot and complete the webquest worksheet.

Engage - Assess Prior Knowledge/Current Thinking/Framing the Unit

To check students' background knowledge I will begin by asking them "What is a supermoon?" Students will share their answers with their elbow partner. I will also ask "What do you think causes a supermoon?" Students will write their answers in their science journals and then share with the class. To introduce students to what is a supermoon, I will show them a video called "Supermoon! What is it and How Often Does it Occur?" https://www.youtube.com/watch?v=8DJc7p1WDSE.

Explore

Students: Students will begin completing a webquest to learn more about supermoons. Students will go to the following website and answer questions about supermoons https://www.jpl.nasa.gov/edu/news/2017/11/15/whats-a-supermoon-and-just-how-super-is-it/.

Webquest Questions

1. How is the moon's orbit around the sun?
2. What is the farthest point in the moon's orbit called?
3. What is the closest point in the moon's orbit called?
4. How long does it take for the moon to orbit around the sun?
5. What causes a supermoon?
6. What is the scientific name for a supermoon?
7. How much larger is a supermoon from a full moon?
8. By how much does the brightness of the moon increase in a supermoon?
9. What to not expect when there is a supermoon?

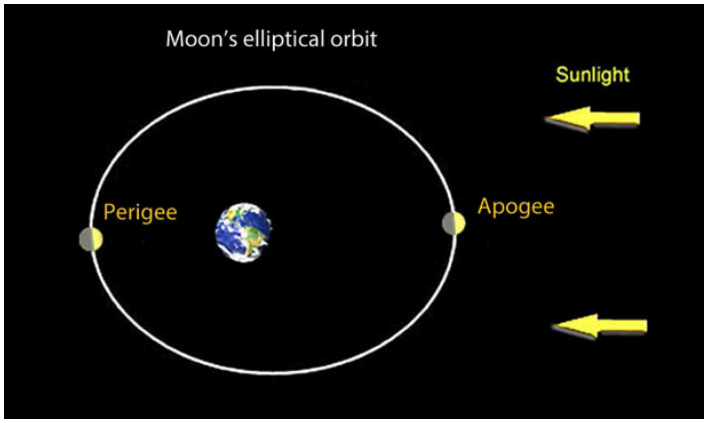
Draw a picture of the position of the moon in a supermoon? Label the perigee and apogee.

After completing the webquest questions, students will demonstrate what causes a supermoon. They will be given a lamp without the shade, a styrofoam ball, and a pencil. Students will stick the pencil into the styrofoam ball to represent the moon. The students' head will represent the Earth and the lamp will represent the sun. Students will

spin around and show that a supermoon happens during a full moon. They will bring the styrofoam ball closets to them to represent a perigee and furthest away from them to represent an apogee.
Teacher: I will walk around to check for understanding. I will ask questions such as "What is the difference between an perigee and an apogee?" and "What causes a supermoon?" During the exploration, my job is to guide students and answer questions they have.

Explain

Students: After answering the questions and physically demonstrating what causes a supermoon, students will present their answers to the class. They will explain what causes a supermoon. They will define a perigee and an apogee to the class and they will also show their drawing of the position of the sun, earth and moon in a supermoon.
Teacher: I will explain that a supermoon happens because the Moon does not orbit around the sun in a perfect circle. The Moon orbits Earth in an ellipse. A full moon happens when a full moon is its closest distance to Earth. This is called a perigee. When the Moon is the furthest distance to Earth, it's called an apogee. The Moon becomes 14% larger and 30% brighter. A supermoon affects tides by about 2 inches, but there is no evidence that supermoons cause natural disasters Supermoons usually occur every 14 months.
https://www.youtube.com/watch?v=lhKMQIRdaeo.



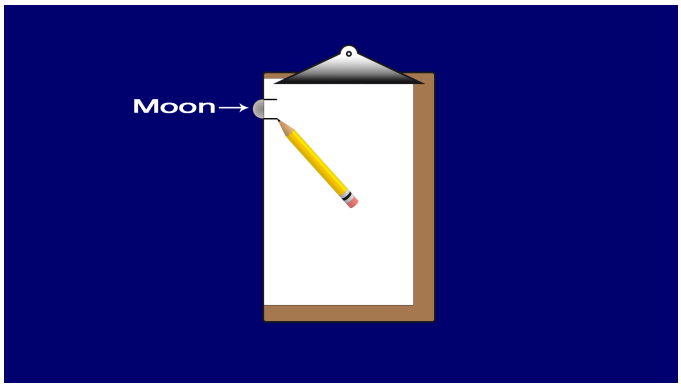
Elaborate/Extend

Students: Students will learn how to measure the size of a full moon in the sky. Students will measure multiple successive full moons to see if there's a change in size. This activity is from
https://www.jpl.nasa.gov/edu/teach/activity/measuring-the-supermoon/#analog.

Procedures from NASA: Jet propulsion Laboratory California institute of Technology:

- "Make note of where the full Moon is in the sky. Students can use stationary objects (buildings, trees, power poles, etc.) to find its relative location, or measure the Moon's location using altitude (vertical position) and azimuth (horizontal position)" (NASA: Jet propulsion Laboratory California institute of Technology).
- Take a computer paper and line it up with the edge of a clipboard. Tape it so it does not move.
- Hold the paper one to two feet from your face. Make sure you use the same distance every time you measure a full moon.
- Line up the edge of the paper with the moon.

- Draw lines where the top and bottom of the moon intersect with the paper. Measure the distance between the two lines in millimeters and write it down on a chart.



Evaluate

Formative Assessment:

- Students will keep track of the size of a full moon for several months. To assess students, we will play a Kahoot game. This will help me figure out if students understood the information. I created this Kahoot game. https://create.kahoot.it/details/supermoon/935b7f12-7b5e-4038-b185-9445fd783253.

References

National Geographics (2017). "What is a Supermoon?" [video]. *Youtube*. Retrieved from https://www.youtube.com/watch?v=lhKMQIRdaeo.

Orr, K. "Measuring the Supermoon." *NASA: Jet propulsion Laboratory California institute of Technology.* Retrieved from https://www.jpl.nasa.gov/edu/teach/activity/measuring-the-supermoon/#analog.

Taernier, L (2017). "What's a Supermoon and Just How Super is it?" *NASA: Jet propulsion Laboratory California institute of Technology.* Retrieved from https://www.jpl.nasa.gov/edu/news/2017/11/15/whats-a-supermoon-and-just-how-super-is-it/.

VideoFromSpace (2017). "Supermoon! What is it and How Often Does it occur?" [video]. *Youtube.* Retrieved from https://www.youtube.com/watch?v=8DJc7p1WDSE.

Lesson Plan 5 - Why do we see the moon during the daytime?

EDD 485 - Teaching Science in the Elementary/Middle School Grades - University of Michigan - Dearborn

Narrative / Teacher Background Information

Name: Zeinab Abdullah

Grade Level: 6th

Concept: Earth Science: Space System

Phenomenon: Daytime Moon

Extra Lesson Additive: Simulation
https://pbslm-contrib.s3.amazonaws.com/WGBH/buac19/buac19-int-earthsunmoon35model/index.html
Simulation packet
https://view.officeapps.live.com/op/view.aspx?src=https://d43fweuh3sg51.cloudfront.net/media/media_files/cedef81d-b17f-4d94-8fdf-a24517fca3c3/6ba482c9-f33c-49cd-90aa-778f1b5eb4e7.docx.

Michigan Science Standards:

- MS-ESS1-1 Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.

Objective(s):

- Students will be able to explain why we are able to see a moon during the day.
- Students will be able to draw diagrams showing why we see the moon during the day and at night.

Students - Prior Knowledge:

- Students should already know that we get days and nights because the Earth rotates on its axis.
- Students should already know that the moon orbits around the Earth.
- Students should already know the moon phases.
- Students should already know that half of the moon is always lighted by the sun.
- Students might have already observed a daytime moon.

Students - Possible Misconceptions:

- We can only see the moon at night.
- The Moon starts rising as soon the sun goes down.
- The moon is always directly opposite of the Sun.
- The moon makes its own light.

Lesson Vocabulary

- **Orbit:** "An orbit is the path of an object around a particular point in space, for example the path the moon takes around the Earth" (esa kids).
- **Daytime moon:** Moon we see during the daytime.
- **Reflecting**: the return of light or sound waves from a surface.

Lesson Materials

- Science Journals
- Simulation https://pbslm-contrib.s3.amazonaws.com/WGBH/buac19/buac19-int-earthsunmoon35model/index.html
- The daytime and nighttime moon packet by PBS LearningMedia https://view.officeapps.live.com/op/view.aspx?src=https://d43fweuh3sg51.cloudfront.net/media/media_files/cedef81d-b17f-4d94-8fdf-a24517fca3c3/6ba482c9-f33c-49cd-90aa-778f1b5eb4e7.docx.
- "Beautiful Blue Sky, Daytime Moon, & Sun on Cinco de Mayo!" Youtube video https://www.youtube.com/watch?v=sMqCTzanL9M.
- Chromebooks
- Promethean board
- Color pencils/markers to draw diagrams
- "Why Can We Sometimes See The Moon During The Day?" Youtube video https://www.youtube.com/watch?v=Ahci-2DFXBo.
- Why Do We Sometimes See The Moon During The Day? Article https://www.vpr.org/post/why-do-we-sometimes-see-moon-during-day#stream/0.
- Why can we see the moon during the day? Article https://www.planetsforkids.org/why-can-we-see-the-moon-during-the-day.html.
- Moon Journals from beginning of unit
- Brainpop Internet safety video https://jr.brainpop.com/health/besafe/internetsafety/.

Safety Concerns/Materials Guidelines/Cleanup Procedures

Safety Concerns:

- For this lesson students are doing online explorations. So, students should know about Internet safety. This Brainpop video does a great job explaining Internet safety. https://jr.brainpop.com/health/besafe/internetsafety/.

Materials Guidelines:

- Students will get their assigned Chromebooks from the cart and go to the online simulation.
- Students will get a packet and will fill it out by looking at the simulation.
- Students will read the "Why can we see the moon during the day?" Article and revise the predictions they made in the beginning of the lesson.

Cleanup Procedures:

- Students will return the chromebooks.
- Students will turn in their simulation packet.
- Students will also turn in their activity from the extension.

Technology Incorporated

- Promathean board to show the Youtube videos.
- Chromebooks so students can look at the simulation and complete the packet that goes along with it.

Engage - Assess Prior Knowledge/Current Thinking/Framing the Unit

To begin this lesson, I will start by showing students a video of a daytime moon. After watching the video, I will ask "Have you ever seen a moon during the day?" Students will share with the class. Then I will ask "Why do we sometimes see the moon during the daytime?" Students will write their predictions in their science journals and

then share their answers with their elbow partner. I will explain that for this lesson we will investigate why we see a daytime moon.
https://www.youtube.com/watch?v=sMqCTzanL9M.

Explore

Students: Students will use the "Moon Phases Simulation Viewed from Earth and Space" to help them understand why we see a moon during the day. In the simulation, a person is standing on Earth. The students will rotate the person counterclockwise to observe how we get day and night. While rotating the person, they will also be able to see the moon orbiting around the Earth. In addition to that, students will be able to see the moon phases and when we can see the Moon during the daytime. PBS Learning Media has a worksheet that goes along with the simulation. Here is the link to the worksheet
https://view.officeapps.live.com/op/view.aspx?src=https://d43fweuh3sg51.cloudfront.net/media/media_files/cedef81d-b17f-4d94-8fdf-a24517fca3c3/6ba482c9-f33c-49cd-90aa-778f1b5eb4e7.docx.

https://pbslm-contrib.s3.amazonaws.com/WGBH/buac19/buac19-int-earthsunmoon35model/index.html

Teacher: I will walk around to check if students understand how to use the simulation. I will ask questions such as "Where is the person facing during daytime?" and "Where is the moon's position when we can see it during the daytime?" During the exploration, my job is to guide the students and make sure that they are not lost.

Explain

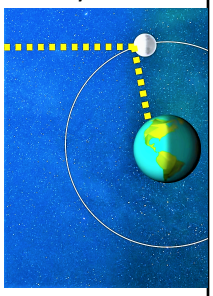
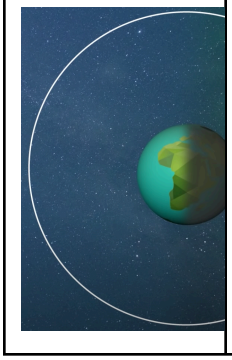
Students: After completing the packet, students will present their findings to the class. They will first explain what causes day and night. They will explain why we are able to see the moon during the day. The students will use the models they drew from the simulation to support their answers. One of their tasks is to collect data using the simulation to determine which days the Moon is in the day and night skies. Students will compare their data with their classmates.

Teacher: I will explain that the moon appears during the daytime because the sun and the moon are not opposite from each other. The moon appears just as often during the day as it does at night. It's just sometimes it's harder to see it. We get day and night because the Earth is spinning around. The moon orbits around the Earth. We are able to see the moon because the sun's light reflects it back to our eyes. Sometimes the lighted part of the moon faces the daytime side of Earth and that's why we see it during the day. John O'Meara answered this question by saying "When we see the moon during the day it's because the moon is in the right spot in the sky and it's reflecting enough light to be as bright, or brighter, than the sky."

https://www.youtube.com/watch?v=Ahci-2DFXBo
https://www.vpr.org/post/why-do-we-sometimes-see-moon-during-day#stream/0

Elaborate/Extend

Students: Students will read one more article to learn about why we see the moon during the daytime. After reading the article, students will take out their science journals and revise their prediction from the beginning of the lesson. The students will fold a paper into four sections. In the first section, students will write their prediction from the beginning of the lesson. In the second and third section, the students will draw a diagram of why we see the moon during the day and at night. In the last section, students will write the scientific answer of why we see the moon during the daytime. https://www.planetsforkids.org/why-can-we-see-the-moon-during-the-day.html.

Prediction: Why do we see the moon during the day?	Diagram showing why we can see the moon during the daytime. 
Diagram showing why we see the moon at night. 	After lesson Scientific answer: Why do we see the moon during the day?

After that students will look at their moon journal that they were assigned in the beginning of the unit. I will ask students to count how many days they observed the moon during the daytime.

Evaluate

Formative Assessment:

- To evaluate students, I will collect the packet they filled out during exploration. I will check if students were able to draw diagrams and answer the questions. If students are still struggling to answer the question "Why do we see the moon during the daytime?" I will go back and explain the concepts they're struggling with. I will also check their prediction, diagrams and scientific answer from the extension. I will look to see if there is an improvement in their prediction and scientific answer.

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Lesson Plan 6 - What causes a Moon halo?

EDD 485 - Teaching Science in the Elementary/Middle School Grades - University of Michigan - Dearborn

Narrative / Teacher Background Information

Name: Zeinab Abdullah

Grade Level: 6th

Concept: Earth Science: Space System

Phenomenon: Moon Halo

Extra Lesson Additive:

Michigan Science Standards:

- MS-ESS1-1 Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.

Objective(s):

- Students will be able to conduct research to figure out what causes a Moon halo.
- Students will be able to present their findings about what causes a Moon halo to the class.

Students - Prior Knowledge:

- This is the end of the unit, so students should know a lot about what causes changes in the moon's shape. Students should already know the moon phases. They should know that the position of the sun, moon and earth cause the changings in the shape of the moon. Students should also know about what causes lunar, and solar eclipses. In addition to that students learned about supermoon and why we see moons in daylight. For this lesson, students might have already observed a moon or sun halo.

Students - Possible Misconceptions:

- Moon halos can only occur in winter. This is a misconception because even though they commonly happen in winter, a moon halo can happen anytime.
- When there is a moon halo it will always rain. This is a misconception because sometimes moon halo will happen but no bad weather.
- You should not look up at a moon halo. It can damage your eyes.

Lesson Vocabulary

- **Halo:** a circle or light around the sun or moon.
- **Ice crystals:** form high in the clouds when water freezes.
- **Cirrus clouds:** are high clouds and are made up of ice crystals.
- **Refract**: another word for refract is bend.

Lesson Materials

- Science journals

- Moon halo introduction video https://www.youtube.com/watch?v=jBDvyaFzPu0.
- Have you seen this: a halo around the sun or moon video https://www.youtube.com/watch?v=CTEt3eBaKQ4.
- This is what causes the halo around the sun video https://www.youtube.com/watch?v=SNNDluUCiBw.
- Halo Around the Moon article https://earthsky.org/todays-image/halo-around-the-moon.
- Breakdown: Why the moon can have a halo around it https://www.wmcactionnews5.com/2020/01/15/breakdown-why-moon-can-have-halo-around-it/#:~:text=What%20you%20were%20seeing%20is,are%20thin%20wispy%20cirrus%20clouds.
- Chromebooks
- Promethean board
- Computer paper
- Markers/color pencils
- PowerPoint

Safety Concerns/Materials Guidelines/Cleanup Procedures

Safety Concerns:

- Like the previous lesson, students will be doing online explorations. I will just remind them what we learned about internet safety. I could show the brainpop video again if I need to.

Materials Guidelines:

- Students will get their assigned chromebook.
- Students will do online research on what causes a halo around the moon.
- Students will create a PowerPoint presentation.
- For the extension, students will receive a computer paper and they will fold it into four sections.

Cleanup Procedures:

- Students will return their chromebook back to the cart.
- Students will put away markers or color pencils they used for the extension activity.
- Students will hang up their extension activity around the classroom.

Technology Incorporated

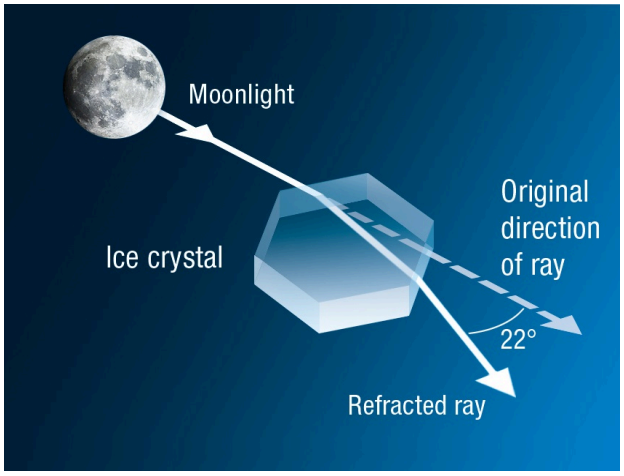
- Promethean board to show the Youtube videos.
- Chromebooks so students could research about moon halos and create a PowerPoint presentation.

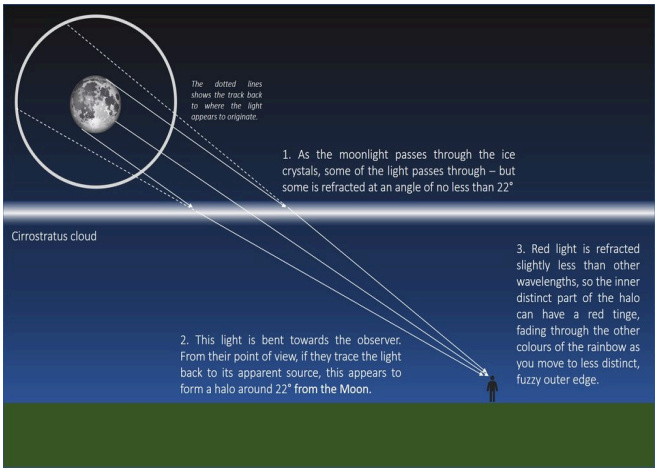
Engage - Assess Prior Knowledge/Current Thinking/Framing the Unit

To introduce students to this lesson I will begin by showing them a short video showing a Moon halo. I will ask students “What do you notice around the Moon?” Students will share their observations. Then I will introduce that what they saw in the video is called a Moon halo. I will ask “What do you think causes a moon halo?” Students will write their predictions in their science journals. I will ask students to share some of their predictions to the class. https://www.youtube.com/watch?v=jBDvyaFzPu0.

Explore

Students: For exploration, students will begin by looking at two diagrams showing what causes a moon halo. Students will write a hypothesis based on the diagram then they will do online research to check their hypothesis. Students will read articles and watch Youtube videos to determine the cause of a moon halo. Then they will create a PowerPoint presenting their findings to the class.





Here are some examples of articles and videos students can use to figure what causes a moon halo. https://www.youtube.com/watch?v=CTEt3eBaKQ4 https://www.youtube.com/watch?v=SNNDluUCiBw. This video explains what causes a sun halo, but it's the same as what causes a moon halo. This will allow me to see if students are able to make a connection between the two. https://earthsky.org/todays-image/halo-around-the-moon https://www.wmcactionnews5.com/2020/01/15/breakdown-why-moon-can-have-halo-around-it/#:~:text=What%20you%20were%20seeing%20is,are%20thin%20wispy%20cirrus%20clouds.
These resources will help students answer the question for this lesson.
Teacher: I will walk around to check student's understanding. I will ask "What are ice crystals and where can they be found?", "What kind of clouds cause halos?" and "What causes a moon halo?" These questions will help guide students to answer the question for this lesson.

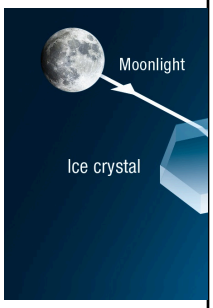
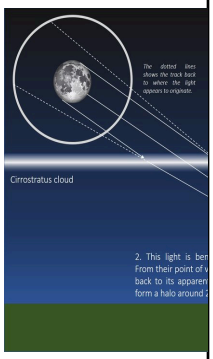
Explain

Students: After doing the research, students will explain their findings to the class. Students will present their PowerPoint presentation. In their presentation, they will answer the questions "What are ice crystals?," "What is a halo?," and "What causes a halo around the moon?" Students will explain diagrams that they have included in their PowerPoint presentation.
Teacher: I will explain that halo around the moon is called a lunar halo. What causes it is the moonlight passes through thin ice crystals which are found in high cirrus clouds. Clouds contain millions of ice crystals. When the moon shines it refracts or bends off those ice crystals and it creates that halo around the moon or sun. Sometimes a halo around the moon tells us that it will rain, but not always. Halos are common in winter, but they can happen anytime. I will use the diagrams from the exploration while explaining this phenomenon.

Elaborate/Extend

Students: Just like the previous lesson students will revise their prediction from the beginning of the lesson. They will fold a computer paper into four sections. In the first section, students will write their predictions from the beginning of the lasson. In the second section, students will draw a diagram of what causes a moon halo. In the third section students will write the scientific answer of what causes a moon halo and in the last section students will write their favorite facts they learned from this lesson. After completing the four square activity we will hang them around the classroom so students could reference them when they need to.

Prediction:	Diagrams

What causes a moon halo?	explaining what causes a moon halo.  
Scientific Answer: What causes a moon halo?	Favorite facts from this lesson.

Evaluate

Formative Assessment:

- For formative assessment I will check the students PowerPoint presentation and the frayer model from the extension. I will use these to check for students' understanding. If students are still struggling, I will go back and teach certain concepts.

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