Tennessee Tech University  
Lesson Plan Template

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| Name: Aaron Brown, Dana Crabtree, Jessica Rolen, and Chelcie Tuell  Date: 10/7/13 Lesson Title: Moon Watchers Grade/Level: Sixth Grade |
| Curriculum Standards |
| Grade Level Expectations:  GLE 0607.6.3 Explain how the positional relationships among the earth, moon, and sun control the length of the day, lunar cycle, and year.  GLE 0607.6.4 Describe the different stages in the lunar cycle.  GLE 0607.6.7 Describe the causes of lunar and solar eclipses.  Checks for Understanding:  0607.6.7 Model the positions of the earth, moon, and sun during solar and lunar eclipses.  State Performance Indicators:  SPI 0607.6.4 Explain the different phases of the moon using a model of the earth, moon, and sun.  SPI 0607.6.7 Explain the difference between a solar and a lunar eclipse. |
| Focus Questions/Big Idea/Goal (List all 3) |
| *What question(s), big idea(s), and goals drive your instruction?*  **Questions:**  What are the eight phases of the moon?  What is a lunar eclipse?  What is a solar eclipse?  **Big Ideas:**  Students will recognize the eight phases of the moon. New Moon, Waxing Crescent, First Quarter, Waxing Gibbous, Full Moon, Waning Gibbous, Last Quarter, Waning Crescent.  Students will recognize a lunar eclipse.  Students will recognize a solar eclipse.  **Goals:**  Students will be able to understand the differences in the phases of the moon.  Students will be able to understand the difference between solar and lunar eclipse. |
| Lesson Objective(s) |
| *Objectives are measurable.*   * Students will be able to identify and label the phases of the moon. * Students will model the movement and relative positions of the earth, moon, and sun. * Students will be able to correctly explain what causes the phases of the moon. * Students will be able to identify the difference between a solar and lunar eclipse. |
| Vocabulary/ Academic Language |
| *List and define your vocabulary.*  Students will have an opportunity to use this vocabulary during the phases of the moon activity. Students will need to identify the names of the different phases and what they are actually doing to see the phases. Teacher will help students practice vocabulary words during the moon phases activity, card sort, and moon phases folded minibook.  1. ***Rotating*** - To turn around on an axis or center.  2. ***Revolving/Orbiting*** – Path of an object around a point in space.  3. ***New Moon*** – Lighted side of the moon faces away from the Earth. The sun, earth, and moon are all in a straight line, with the moon being in the middle.  4. ***Waxing Crescent*** – Seen after the New Moon, but before the First Quarter Moon. This is when a small portion on the right side of the moon is lit by the moon and the rest of the moon is dark.  5. ***First Quarter*** – The right half of the Moon appears lighted, and the left half is left darkened. This is when the right half of the moon is lit up and the left half of the moon is dark.  6. ***Waxing Gibbous*** – Seen after the First Quarter Moon, but before the Full Moon. This is when a small portion on the left side of the moon dark and the rest of the moon is lit up.  7. ***Full Moon*** – Lighted side of the moon faces the Earth. This is when the moon is completely lit up by the sun.  8. ***Waning Gibbous*** – Seen after the Full Moon, but before the Last Quarter Moon. This is when a small portion on the right side of the moon is dark and the rest of the moon is lit up.  9. ***Last Quarter*** – The left half of the Moon appears lighted, and the right half is left darkened.  10. ***Waning Crescent*** – Seen after the Last Quarter Moon but before the New Moon. This is when the right half of the moon is lit up and the left half is dark.  11. **Waxing**- Illumination is increasing.  12. **Waning**- Illumination is shrinking.  13. **Lunar Eclipse-** an eclipse in which the full moon passes partially or wholly through the earth's shadow  14. **Solar Eclipse-**an eclipse in which the sun is obscured by the moon. |
| Material/Resources |
| **Card Sorts (Small Group):**   * moon phases pictures * moon phases name   **Phases of the Moon Activity (Partners):**   * Styrofoam ball * Light source * Pen or pencil (to mount styrofoam ball)   **Moon Phases folded minibook (Individual):**   * paper * markers |
| Assessment/Evaluation |

**Formative***: How will students demonstrate understanding of lesson objective(s)? How will you monitor and/or give feedback?*

**Card Sort:** Students will demonstrate their understanding of lesson objectives by arranging and labeling moon phases cards in the correct order. Teacher will monitor the class by walking around the room and helping students make corrections. After, the teacher will explain the order of the moon’s phases and let students correct their card sort order, if incorrect. This activity will occur at the beginning of the lesson as a pre-assessment of students’ knowledge of the moon phases.

**POMS- Point of Most Significance:** Teacher will open up the class to a discussion about what they thought the most important part of the lesson was and why. If the students’ important points are different from what the lesson is intended then the teacher will clarify and put more emphasis on the key points. This will happen at the end of the lesson.

**What are you doing and why?:** Teacher will askstudents to describe what they are supposed to be learning from the activity and how the task they are working on will help them learn. This will happen during activities presented during the lesson.

**Justified True or False Statements:** Students will answer true or false to the questions about the moon. This pre-assessment will test students knowledge of common misconceptions.

**Summative:** *What evidence will you collect and how will it document student learning/mastery of lesson objective(s)*

***Moon Phases Quiz:*** The students will be tested on the phases of the moon. The questions will center on identifying the correct phases of the moon, correctly ordering the phases, and determining what the phases are called when the lit part of the Moon is shown. This assessment is going to be given at the very end of our lesson, before the closure. This quiz is going to serve as an evaluation of the students’ knowledge of the moon’s phases.

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| Instruction  (Include a suggested time for each major activity) Total time: 70 minutes | List Questions for higher order thinking *These cannot be answered by yes or no.*  (Identify Bloom’s Level of Thinking) |
| Set/Motivator: *How will you engage student interest in the content of the lesson? Use knowledge of students’ academic, social, and cultural characteristics.*  **Engage: 10 minutes**   1. Teacher(s) will give a pre-assessment (justified true and false) to students to identify students’ prior knowledge and misconceptions about the moon. 2. Teacher(s) will give a pre-assessment (card sorts) to students to identify student’s prior knowledge about the moon’s phases. 3. Teacher(s) will demonstrate the Phases of the Moon activity following the student directions listed below. | **Remember:** What are the eight phases of the moon?  **Remember:** Which is true or false? |
| Instructional Procedures/Learning Tasks**:** *Provide specific resources/details of lesson content and delivery.*  **Explore:**  **Phases of the Moon Activity: 20 minutes**   1. Allow 5 seconds for students to choose a partner. 2. Give the light source to one of the partners. 3. Give the other partner a styrofoam ball and pen/pencil to mount ball on. 4. Turn out the classroom lights, to make the phases of the moon more visible. 5. The light represents the sun. The ball represents the moon. Students’ head will represent the Earth. Hold the ball in your hand and turn so that the “moon” is between you and the “sun.” 6. Slowly turn your body counterclockwise keeping the Earth (student’s head) facing the moon (styrofoam ball). Notice the edge of the shadow as it moves across the moon. 7. Stop once you have completed ⅛ of a revolution and notice the appearance of the moon. 8. Continue turning counterclockwise until you have completed ¼ of a revolution and notice the appearance of the moon. 9. Have students describe what they see and what appears to be happening to the moon. 10. Continue turning counterclockwise until you have completed ⅜ of a revolution and notice the appearance of the moon. 11. Continue turning counterclockwise until you have completed 1/2 of a revolution and the sun is behind your head. You will need to raise the moon slightly so that the shadow of your head does not fall on the moon. Notice the appearance of the moon. 12. Explain to students that not moving their head would result in casting a shadow over the moon which would result in a lunar eclipse. 13. Continue turning counterclockwise until you have completed ⅝ of a revolution and notice the appearance of the moon. 14. Have students describe what they are seeing with the moon and what appears to be happening. 15. Continue turning counterclockwise until you have completed ¾ of a revolution and notice the appearance of the moon. 16. Continue turning counterclockwise until you have completed ⅞ of a revolution and notice the appearance of the moon. 17. Continue turning counterclockwise until you have completed a full revolution. Notice the appearance of the moon. 18. Have students align their head, the ball, and the light source and describe what they see (solar eclipse). 19. Have students repeat the process as many times as needed to gain a clear understanding of the phases of the moon as well as positions of the Earth, moon, and sun during this process.   **Explain:**  **15 minutes**  **Phases of the Moon Activity Discussion**  The teacher will:   * Ask the students to describe what they saw happening to the moon as they moved counterclockwise up to the ½ point of rotation and then from ½ to the full point of rotation. * Discuss the actual length of the lunar cycle which is 29.5 days. * Explain that this model is not to scale and that the actual scale would be closer to using a softball as the moon and a basketball as the Earth. * Help students to describe the different phases they are observing using proper vocabulary. * “Mr. Lee- Phases of the Moon rap” Youtube video   **Moon Phases folded minibook 10 Minutes**  Students will follow teacher’s oral instructions in creating a folded minibook.  1. Start with a rectangle. Place the length (long edges) at the top and bottom. Fold in half lengthwise (hotdog fold)  2. Fold in half widthwise (hamburger fold). Do not unfold.  3. Fold the left side over to meet the right side. Crease steps 3 and 4 sharply.  4. Unfold the last step. Repeat step 3 on the back. Unfold.  5. Cut along the centerline from the **folded** side to the midpoint.  6. Unfold.  7. Fold the top edge down to the bottom again.  8. Push together to form a book, using the folds you have made. It creates a booklet with 8 pages.  Then, students will draw and label moon phases: New Moon, Waxing Crescent, First Quarter, Waxing Gibbous, Full Moon, Waning Gibbous, Last Quarter, Waning Crescent.  **Extend: 10 Minutes**  **POMS Point of Most Significance (FACTs):** Teacher will open up the class to a discussion about what they thought the most important part of the lesson was and why. Also, teachers will give students the opportunity to discuss if there is anything else that would like to learn about the moon.  Students will document the moon every day for a month in their science journals by drawing a picture of what they see and labeling the moon phase. Students will turn this in and it will be graded for completeness and correct labeling. | **Remember:** Can you name the eight phases of the moon?  **Understanding:** Can you explain what is happening to the light as the moon orbits the earth?  **Analyzing:** Contrast a waxing gibbous moon and a waning gibbous moon. What’s the difference between the two?  **Analyzing:** Is the same side of the moon always facing earth?  **Applying:** Illustrate the phases of the moon.  **Analyzing:** What would happen if the moon disappeared?  **Creating:** Create a folded minibook depicting the phases of the moon.  **Understanding:** How would you explain a solar and lunar eclipse?  **Evaluating:** What did you learn about the eight phases of the moon?  **Understanding:** What was the main idea of the lesson? |
| Closure: *Verbalize or demonstrate learning or skill one more time. May state future learning.*  **5 minutes**  Students will pair up and quiz each other using the folded minibook they have created. Also, students will use the card sorts from the pre-assessment to correctly order the phases now that the lesson is complete.  The teacher will conclude the lesson by asking the students to put the phases in order with the card sort. | **Understanding:** How would you explain the eight moon phases? |

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| Adaptations to Meet Individual Needs: *How will you adapt the instruction to meet the needs of individual students? Include -*  *ELL?; SPED?; Gardner’s Learning Styles - Name and specify what happens in the lesson that uses each learning style listed; Other individual needs of the students/class you are teaching?*  **Gardner’s Learning Styles:**  Verbal/Linguistic: Students will have the opportunity to use vocabulary during the moon phases activity. Students will describe what they see and identify the moon phases. Students will also use their vocabulary in making the moon phases folded minibook.  Bodily/Kinesthetic: Students will be engaged in hands-on learning while doing the moon phases activity. Students will use their body to rotate to see the different phases of the moon.  Visual/Spatial: Students will be able to create a folded minibook to document what they saw during the moon phase activity. Students will have a full visual during the moon phases activity.  Intrapersonal: Students will have the opportunity to analyze and share what they thought the main point of the lesson was. Students will also have the opportunity to discuss what they are seeing during the moon phases activity.  Interpersonal: Students will interact with the card sort and moon phases activity. During the card sorts students will be able to discuss their thoughts about what the different moon phases are and what order they belong in. Students will discuss, with their partner, what they are seeing during the moon phases activity.  Mathematical/logical: Students will use fraction number sense to make the turns as they model the moon phases.  For ELL and special needs students they will be paired with a partner that will help assist them during activities. Their partner will be a student in the class who is helpful, empathetic, and, if possible, gifted. This partner will be able to work with the student during all activities if the ELL or special needs student needs their assistance. ELL and SPED students will be given more time to complete the folded minibook.  Consult IEP for specific student needs.  A challenging extension activity for some students would be to complete a chart or other visual representation of the moon’s phases outside of class by observing the actual moon over time. Students can compare the phases of the actual moon to those of the activity completed in class.  **Management/Safety Issues:**  **Safety Issues:** Students will be using a flashlight during the moon phases activity. It will be important to explain to students not to flash the light in each others eyes and to not stare at the light. The area will also be cleared of tripping hazards because the activity is done in the dark.  **Management Issues:** The teacher will want to direct students to use the light source on the objects only and to not shine the light in other student’s eyes. Also, the teacher will need to keep students focused during activities and during transition periods of the lesson. |
| Rationale/Theoretical Reasoning:  **Common Misconceptions:** Students may believe that the moon phases are created by the earth’s shadow, but the phases are actually just our perspective of the moon as it orbits earth. Students may also believe that the moon does a complete orbit in one day, but the moon takes nearly 28 days to make a complete orbit. Some may believe that the moon creates its own light; however, the moon only appears to be lit because it is reflecting sunlight. (“What Lights up the Moon?” probe)  **Rationale:**  This lesson is done using hands-on modeling so that students will understand the phases of the moon and to dispel common misconceptions regarding the appearance of the moon. (“Going Through a Phase” probe)  **Theoretical Reasoning:**  Gardner’s Multiple Intelligences - This lesson incorporates visual, kinesthetic, auditory, interpersonal, and intrapersonal learning styles enabling all students to gain understanding of the eight phases of the moon as well as lunar and solar eclipses.  Vygotsky’s Social Learning -This lesson incorporates group activities to enable students to learn from each other.  Bloom’s Taxonomy- Benjamin Bloom’s Taxonomy is being emphasized in the lesson by the teacher asking more in depth questions. By asking these questions, the students are developing higher order thinking skills. Students will gain greater understanding about the moon’s phases and how the moon is important to earth. |
| References: *List the references used in this lesson*  Phases of the Moon activity directions: <http://www.uen.org/Lessonplan/preview.cgi?LPid=623>  Moon Phases Folded Minibook directions: <http://www.halfhollowhills.k12.ny.us/uploaded/SummerSchool/folding_mini-book.pdf>  Science Moon Phase PowerPoint: <http://larochemathmethods.wikispaces.com/Science+5E+Lesson+Plans>  Dr. Lee- Phases of the Moon video: <http://www.youtube.com/watch?v=79M2lSVZiY4>  Lunar eclipse definition: <http://www.merriam-webster.com/dictionary/lunar%20eclipse>  Common Misconceptions: <http://moon.nasa.gov/moonmisconceptions.cfm>  Gardner: <http://www.tecweb.org/styles/gardner.html>  What Lights up the Moon? probe: Uncovering Student Ideas in Primary Science by Keeley (2013) pgs. 109-112  Going Through a Phase probe: Uncovering Student Ideas in Science, Volume 1 by Keeley (2005) pgs. 183-187  Vygotsky: Vygotsky, L.S. (1978). *Mind in Society. The development of higher psychological processes.* Cambridge, MA: Harvard University Press.  Bloom: *Bloom’s Taxonomy.* (n.d) Retrieved from http://www.utar.edu.my/fegt/file/Revised\_Blooms\_Info.pdf |
| Reflections/Future Modifications:*To what extent did the class learn what you intended them to learn? What will be your next steps instructionally? What did you learn about your students as learners? What have you learned about yourself as a teacher?*  Teacher Pre-Reflections:  Students will be actively engaged for the entire lesson because of the multiple activities presented. Our goal was for students to learn about the eight phases of the moon, and to be able to explain what happens during those phases and solar and lunar eclipses. Through the pre-assessments, we will be able to see and understand students’ prior knowledge and misconceptions about the lunar phases that we will be able to address throughout the duration of the lesson. With the completion of the post-assessment it is our hope that students improve on their knowledge, debunk previous misconceptions, and be able to explain to peers, teachers, and others about the eight phases of the moon and solar and lunar eclipses.  Future Pre-Modifications:  With this lesson being planned for an hour’s time, we may run into time constraint problems. We will have to modify the time in the future in order to spent more time on information and material not presented without losing time on other aspects of the lesson. |

Assessments

**Justified True or False Statements on the Moon**

1. The Moon goes around the Earth in a single day?

2. The Moon has no gravity; things float "up" when dropped on the Moon?

3. The Moon doesn't actually shine light itself?

4. There are eight phases of the moon starting with the new moon and ending with the waning moon?

5. The moon is airless, waterless and lifeless?

6. The moon becomes larger on the horizon because it is close to the Earth?

7. Moon has a dark side that is in eternal darkness?

8. A 1st quarter moon means the moon is 25% lit?

9. The moon is the earth’s only natural satellite?

10. The Moon is the only extraterrestrial body to have been visited by humans?

**Answer Key for Justified True or False Statements**

1. False. One revolution takes 27 days, 7 hours, and 43 minutes.

2. False. The moon does have gravity. The Moon's gravity is one sixth that of earth's.

3. False. It is the Sun's light being reflected off of the Moon.

4. True.

5. True.

6. False. The moon becoming larger on the horizon is only an optical illusion.

7. False. The moon is lit up about half of the time and dark the other half.

8. False. Moon phases have two points named quarters First Quarter and Last (or Third) Quarter. The word quarter is not referring to the portion of the moon lit, but instead refers to the phase of the lunar cycle.

9. True

10. True

**Moon Phases Quiz**

1. What is the name of the moon phase, when we cannot see any of the lit half of the Moon?

a. New Moon c. Full Moon

b. 1st Quarter d. 3rd Quarter

2. What is the phase of the Moon called when you can only see a sliver of the lit part of the Moon?

a. new c. full

b. crescent d. gibbous

3. What is the phase of the Moon called when you can almost see the whole lit part of the Moon.

a. full c crescent

b. new d. gibbous

4.Starting with the New Moon, put all the lunar phases in order until until you get back to the New Moon.

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| New Moon | Waxing Gibbous | Waning Crescent | 3rd Quarter |
| Waxing Crescent | First Quarter | Full Moon | Waning Gibbous |

1. New Moon

2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

5. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

6. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

7. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

5. What are the phases called when the lit part of the Moon we see is increasing?

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6. What are the phases called when the lit part of the Moon we see is decreasing?

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