

Teacher Notes- “Moon Phases-*Finally* Making Sense Of Them”

The moon phases ranks as one of the most misunderstood topics in all of science (the seasons and why the sky is blue also rank up there). What causes the moon phases to change- is it clouds? Earth’s shadow? No, and no.

This activity will transform your classroom into a giant sun, earth, and moon model. An earth will hang in the center of your room and a sun will glare from the side. Then 4 moons will be put around the earth, one representing each major phase. By observing the model, students will be able to understand the moon phases even without an explanation.



Materials per student:

1-student handout- Moon Phases

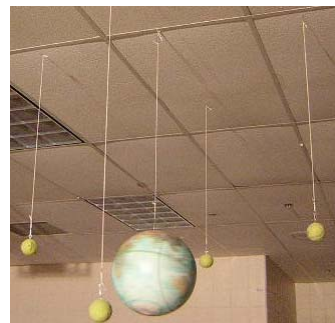
Additional Teacher Materials:

- 1-Earth globe (one you don’t mind taking apart)
- 6-Tennis balls
- 1-Bright shop light
- 2-Toggle bolts
- Paper clips
- String
- 4-Small eye hooks
- A 1/2” x 4 foot dowel rod (or meter stick)-optional

PowerPoint-“Moon Phases”

Beforehand: (begin 2-3 days early)

1. Build your sun, earth, and moon model- see the document in the Resources folder “*Building the Moon Phase Model*”.
2. After you set up the model, spend some quiet time by yourself looking at it, walking around it, and thinking about it. Study it until you feel comfortable explaining the moon phases using it.
3. Close all classroom blinds.
4. Check the dates and times of upcoming moon phases at <http://sunearth.gsfc.nasa.gov/eclipse/phase/phasecat.html> . The times there are



listed in Universal Time. Subtract 5 hours to convert to Eastern Time in the U.S. Students will put this info in the lower-left corner of their handouts.

5. Take the time to fill out the student handout while at the same time going through the activity in your mind. That will give you a better feel for what's going on, and help you explain things better too.
6. When students enter the classroom, have the globe already hanging on its string, unless you absolutely cannot trust them. This will immediately captivate them. Leave the moons (tennis balls) unattached and the sun turned off at first.
7. Set out all materials *the day before*. Leave yourself time to realize you're missing something, research something or even make a change. The morning of, read through the notes one last time. And don't over-do your preparation- that will make you worry about every little detail. This lesson makes it tempting to throw in all kinds of extra topics.*¹ Use the slideshow to guide you through and keep you focused.

Procedure:

1. As students enter class, decide which 4 tall students will help hang the tennis ball moons. (They need to be able to reach and hang their moons without standing on anything. Have the tallest kid in class hang the full moon.) Give them each a tennis ball moon just to hold onto for now.
2. Give each student a copy of the handout, then turn off all classroom lights and plug in the "sun" (bright light).
3. After students have finished reacting to that, give an introduction. As you talk, remember that they're seeing all this for the first time, so talk slowly and deliberately:

Introduction

"Today is about the Moon Phases. Who can name one? (full moon, new moon, 1st quarter and 3rd quarter. If you hear "crescent", connect that with the quarter moons).

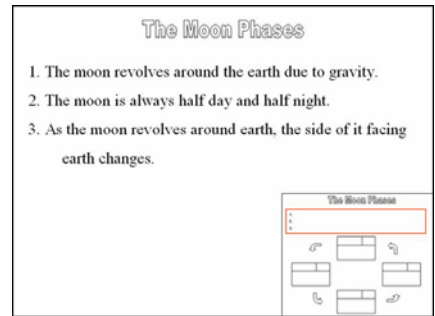
Good! Those are the 4 main phases we'll be covering today. We've all seen a full moon and crescent moons, too. Have you noticed they keep repeating? About how often do we get a full moon? (every month)

My goal is for everyone in this room to understand the moon phases, or why it keeps changing its appearance, when you leave this classroom today. Most people think the earth's shadow is the cause, but this is not true, as you'll see."

4. At this point, walk around the earth globe hanging, and notice what it looks like from each side.*² Since students are seated and cannot see it from all sides like you, refer to 4 students on 4 different sides of it and what they see. One side of the class sees the day side of earth, and the other sees only the night side. Those in the middle have the best seats in the house today. From their perspective, the earth is half and half- the side facing the sun is lit up, and the other is not.

Copy 3
Statements

5. Start the PowerPoint, if you're using it. It will guide you and your students through the entire activity^{*3}. If you don't have a multimedia projector for your screen, copy the student handout onto overhead transparency and fill it in with erasable marker.



6. Begin by having students copy the 3 statements-

1. The moon revolves around the earth due to gravity.

While students are writing statement #1, revolve your moon-on-a-stick around the earth globe counterclockwise over and over and over.... All they have to do is simply watch it revolve and understand that this is what our moon does.^{*4} Most students know that the moon revolves around earth, but have never really thought about what it means or looks like.

The last part of statement 1 mentions gravity, which your moon-on-a-string will help them understand better. Swing the ball around your head and notice that you, the more massive object, are pulling it in towards you.^{*5} That's what the earth does to the moon too- it's as if the moon is swinging around the earth on an invisible rope.

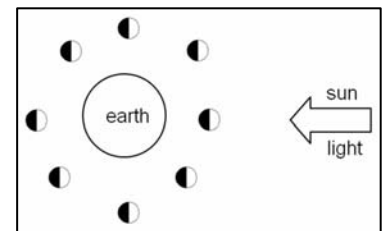
2. The moon is always half day and half night.

To demonstrate this, revolve your moon-on-a-stick again, this time more slowly, noticing that at no time is the moon ever *not* half day and half night.

3. As the moon revolves around earth, the side of it facing earth changes.

This statement combines the first two, showing how they cause the moon phases.

7. The next 3 PowerPoint slides will prompt students to draw a sun, earth, and series of moons (students love it when you refer to them as "moonies") around earth in the middle of their paper.^{*6} This drawing summarizes what they just wrote in those first 3 statements. Their minds should now be primed and ready.^{*7}



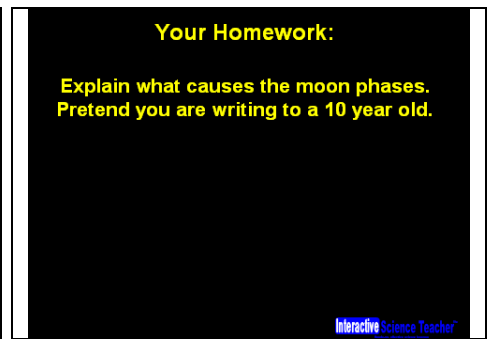
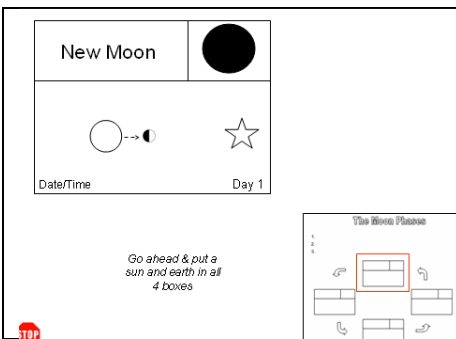
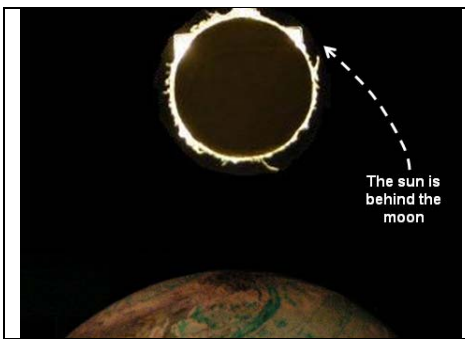
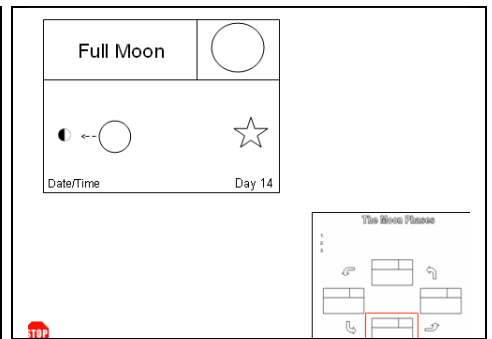
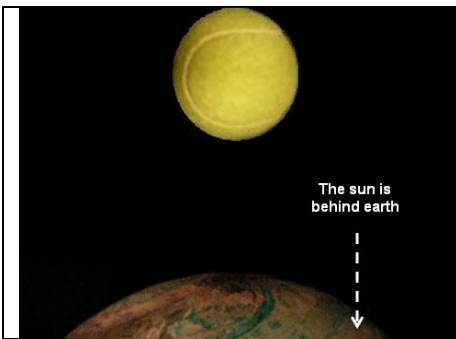
Hang New
Moon

8. Call up the first tall student with a tennis ball and tell them to hang their moon on the string that would cause a *new moon*. You can tell them what a new moon looks like, or simply let them guess. They can get assistance from other students, or make up their minds on their own.
 - After they've chosen a string and hung it there, explain what a new moon is and see if they still agree with where the moon was put, or if they want to change to a different string.

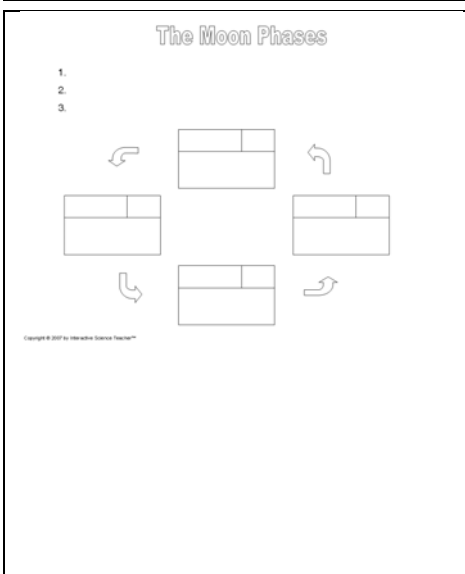
(end of Teacher Notes preview)

Come back and visit InteractiveScienceTeacher.com and for just .99¢ you can download the entire set of Teacher Notes right now, along with:

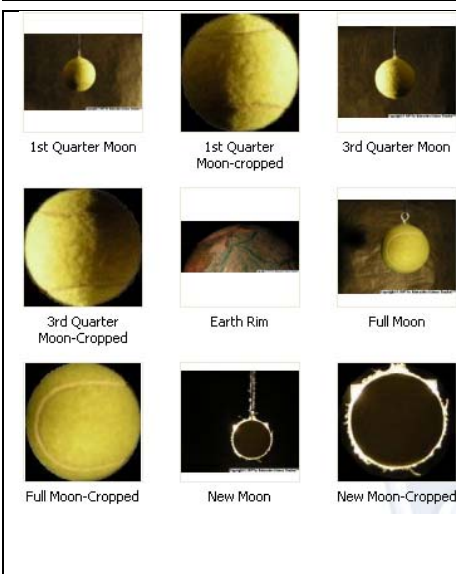
◆ PowerPoint (15 slides) Don't have PowerPoint? Download it FREE: [Mac](#) / [PC](#)



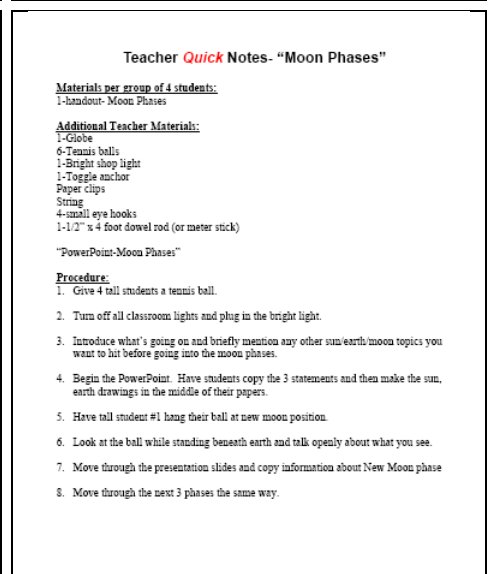
◆ Student Handout



◆ Drawings & Pictures



◆ Quick Notes



◆ Document-How to build the moon phase model (3 pages)

◆ 2 other versions of the student handout-with middle already filled in



C. **Make the 4 teen: ball moons:** Screw a small eye hook² into each of the 4 balls² (you might need to poke/drill a very small starter hole to get it started). Then slip a paper clip through each hook². Undo the end of the paper clip a bit so it will easily grab the loop of string².



D. **The Light:** Use a 100 watt or greater light set near the side of your room, aimed at where the globe will be in the middle. The brighter the light the better- a 500 watt workshop light (shown right) would not be too bright. Secure it down if it's up high or has an extension cord running across a walkway.



II. Next, assemble the model

A. **Hang the globe:** cut 75 centimeters of string (or shorter/longer to your needs), then attach one end of it to your ceiling. If you have tile ceiling the easiest way to do this is to tie a paper clip to one end of the string, which you can then stick into the tile or catch on the metal grid.

At the other free end of the string tie a small loop. Get your globe and slip the paper clip on top of it through the loop, and you're in business.

B. **Hang the 1st and 3rd quarter moons:** these will go on the right and left side of globe. Cut 2 pieces of string 75 centimeters long (or longer/shorter so they're about



Copyright © 2007 by Interactive Science Teacher™

The Moon Phases

- 1.
- 2.
- 3.

