



Introductory: Our solar system and beyond

Title: Discovering the Night Sky: A Hands-On Journey Through Space

Duration: ~1.5 hours

Grade Level: Elementary to Middle School (Beginners)

Objectives:

- Engage students in observing specific celestial objects using the remote telescope.
 - Explore the distinctive features of the Moon, planets, and prominent stars.
 - Encourage curiosity and excitement through direct interaction with astronomical phenomena.
 - Provide a memorable, hands-on experience that fosters a lasting interest in astronomy.
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1. Welcome and Introduction (10 minutes)

- **Greetings and Icebreaker**
 - Welcome students and introduce instructors.
 - Icebreaker question: "If you could visit any place in space, where would it be and why?"
- **Lesson Overview**
 - Outline the day's activities focused on observing specific celestial objects.
 - Emphasize the unique opportunity to use a real telescope stationed in Yunnan.

2. Introduce the targets briefly potentially through Stellarium or image PowerPoint (15 minutes)

The Moon

- **Notable Features**

- **Overview:** Earth's only natural satellite, influencing tides and stabilizing Earth's rotation.
- **Phases of the Moon:**
 - Explain the eight phases: new moon, waxing crescent, first quarter, waxing gibbous, full moon, waning gibbous, last quarter, and waning crescent.
 - Lunar phases occur because the Moon reflects sunlight and has a day side and a night side. As the Moon orbits Earth, we see varying portions of its sunlit side and dark side, which causes the appearance of its phases to change throughout the month.



Image credit: NASA/Bill Dunford

Potential question before viewing the moon through the telescope: the telescope is on the opposite side of the earth, would the moon look the same?

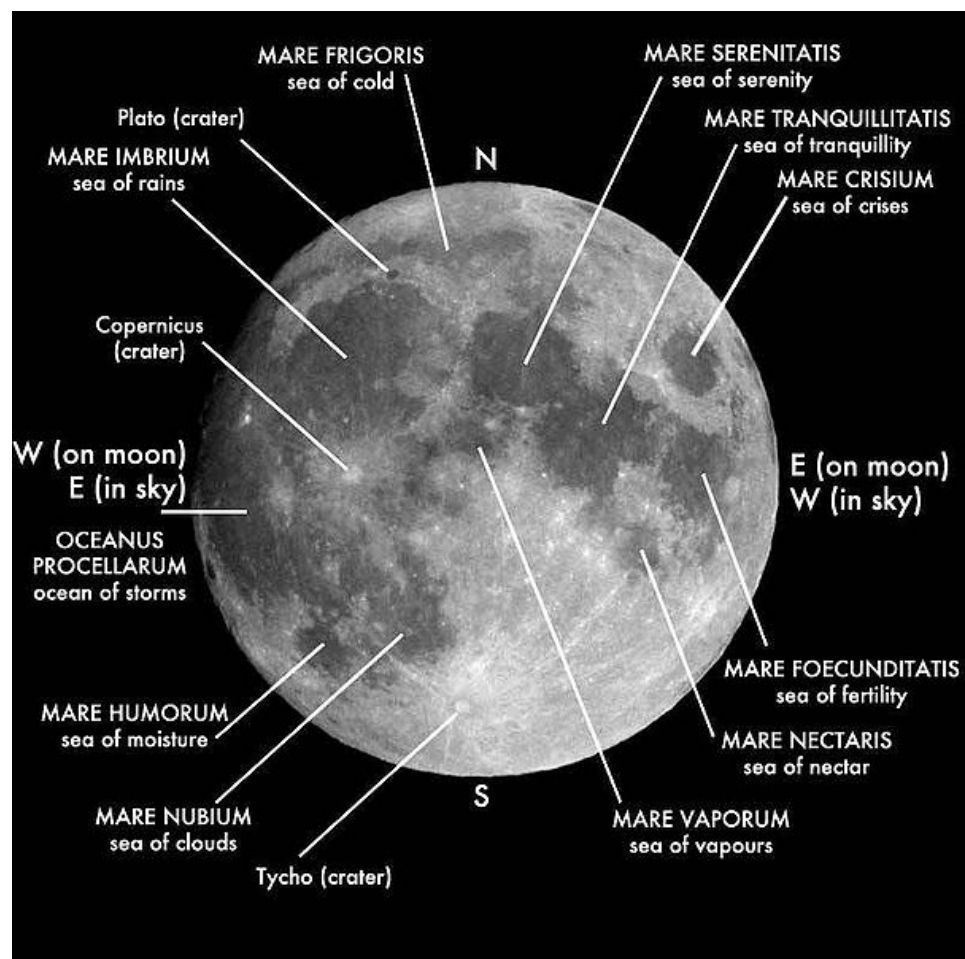
Answer: The moon phase is the same around the earth, though the equator would invert it. Inverted because comes down to orientation, think of it as look from the top and bottom

Can reference this for current moon phase before observations:
<https://www.timeanddate.com/moon/phases/china/kunming>

- Discuss how the Moon's position relative to Earth and the Sun causes these phases.

- **Surface Features:**

- **Craters:** Formed by asteroid impacts; notable craters include Tycho and Copernicus.
- **Maria (Seas):** Dark, flat regions formed by ancient volcanic activity; examples are Mare Imbrium and Mare Serenitatis.
- **Highlands:** Lighter, mountainous regions contrasting the darker maria.



Example image for reference, credit: Swinburne University

Planets

- **Jupiter**
 - **Overview:**

- Largest planet in the Solar System; a gas giant composed mainly of hydrogen and helium.
 - **Distinctive Features:**
 - **Cloud Bands:** Alternating light and dark bands caused by strong atmospheric winds.
 - **Great Red Spot:** A massive, long-lasting storm larger than Earth.
 - **Moons:** 95 known moons; focus on the four largest—Io, Europa, Ganymede, and Callisto (the Galilean moons).
- **Saturn**
 - **Overview:**
 - Second-largest planet; known for its extensive ring system.
 - **Distinctive Features:**
 - **Rings:** Made up of ice and rock particles; divided into several sections (A, B, C rings).
 - **Appearance:** Golden hue due to ammonia crystals in the upper atmosphere.
 - **Moons:** 146 known moons, with Titan being the largest.

Stars and Constellations

- **Orion's Belt**
 - **Overview:**
 - Part of the constellation Orion, one of the most recognizable patterns in the night sky.
 - **Significance:**
 - Consists of three bright stars: Alnitak, Alnilam, and Mintaka.
 - Acts as a guide to finding other celestial objects like the Orion Nebula.

3. Hands-On Telescope Exploration (50 minutes)

- **Observing Celestial Objects**
 - **Guided Observation:**
 - Navigate to pre-selected objects for optimal viewing.
 - **Activity:** Students take turns controlling the telescope to observe each object.
- **Distinctive Features Exploration**
 - **Surface of the Moon:**
 - Zoom in on specific craters like Tycho or Copernicus.
 - Discuss how craters are formed
 - Follow up on discussed seas and craters, ask students if they can match any of the previously introduced features
 - **Planetary Details:**
 - Observe Jupiter's moons transitioning across its surface.
 - Look for Saturn's Cassini Division in its rings.
 - Adjust exposure to see more detail
- **Interactive Discussion**

- Encourage students to describe what they see.
- Ask questions to stimulate thinking: why does the moon have so many bumps and we don't? Why don't other planets have rings? (Besides Uranus). Just how much bigger do you think the Earth is compared to the Moon? What about compared to Jupiter?

4. Celestial Sketching Activity (15 minutes)

- **Drawing Observations**
 - Provide paper and pencils for students to sketch what they observe.
 - **Activity:** Create detailed drawings of the Moon's surface or planetary features.
- **Sharing and Discussion**
 - Students present their sketches.
 - Discuss any surprising or interesting observations.

5. Storytelling with the Stars (10 minutes)

- **Constellation Myths**
 - Share a myth associated with a constellation observed.
 - **Activity:** Students create their own short story inspired by the celestial objects they've seen.
- **Group Sharing**
 - Volunteers share their stories with the class.

6. Conclusion and Q&A (10 minutes)

- **Recap Key Observations**
 - Summarize the celestial objects observed and their distinctive features.
- **Encourage Future Exploration**
 - Provide resources for continued learning (e.g., astronomy apps, websites).
 - Invite students to upcoming astronomy events or sessions.
- **Question and Answer Session**
 - Open the floor for any remaining questions or reflections.