Moon Study Description

TYPE: Individual assignment
FORMAT: Paper, Log, and Presentation
WEIGHT: 15%
LENGTH: 3 to 5 pages + Log sheets for 28 days

MODULES: • Nature of Science • Inquiry

RATIONALE
Studying the moon is an easy and rewarding inquiry that can be easy to implement in the classroom. In addition, it demonstrates the power of observational inquiries in developing understandings of the natural world. It also involves many of the characteristics of the nature of science. In other words, many of the problems, emotional reactions, problems with measurement, etc. that scientists face in their work arise during this inquiry. With children, these experiences can provide the focus for discussions about how science works and about the experiences of scientists. By engaging in this inquiry, children do become young scientists.

• This project exposes you to the experiences of (a) constructing understandings and explanations based on the data you collect (which is what you will want children to do), (b) how science and scientists work (i.e., the nature of science, and (c) doing activities prior to teaching children and then thinking about the implications for learning and teaching.

DESCRIPTION
Over a period of 4 weeks, you will engage in doing science in much the same way as people and scientists have studied the sky for millennia. You will need to spend about 10 to 15 minutes per day observing (or trying to observe 😊) the moon, recording your observations and reactions, and constructing explanations based on your data.
Use the Moon Study Data Sheets (log sheets) that are available on the course CD and the course web site for recording your data, reactions, and initial and developing explanations.

• Record your moon and sun rise and set times from newspapers or on-line sources.
• Read the Moon Study Instructions from the CD or course web page.
• Record all other data on the Moon Log Record Sheet (see instructions below for filling out the log sheet and using your clinometer).

GENERAL REQUIREMENTS

● You MUST hand in two parts:
  a. the Log portion with all of your data (worth 30%)
  b. a type-written paper (described below)

● Staple your log and paper together in the upper left-hand corner. Do NOT put into a binder, folder, or plastic cover.

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Photocopy or scan your log and save as a back-up along with your paper. * If you scan your log, you may submit the log and moon study paper by email.

SPECIFIC REQUIREMENTS

**DO NOT LOOK UP ANY INFORMATION ABOUT THE MOON** (except for rise and set times). You are not graded on the scientific accuracy of your explanations and claims.

- 28 completed log records (10 sheets). Use the back of the sheets if necessary for additional notes.

- You must construct explanations that address three questions:
  1. In which direction does the moon move around the earth (from east to west or from west to east)?
  2. How do the phases of the moon occur?
  3. What does the plane of the moon’s orbit look like (how is the plane of the orbit related to the earth’s equatorial plane)?

- You must develop at least one visual model that explains your answer to at least 2 of the 3 questions.

Project Paper:

- The paper must contain:
  - A summary of your findings.
  - Explanations for each question. These explanations (answers) must use the data that you collected to justify these answers. You MUST show how your answers are supported by evidence from your data.
  - At least one visual model that explains the answer to one or more of the questions. If you use a 3-dimensional (physical) model, please take a photo of this model and embed this photo in your paper.
  - A discussion of how this activity addresses the nature of science (*** you must cite references to chapter 3 ***).
  - A thorough discussion of the implications of this activity for teaching and learning (*** you must cite references to chapters 4, 5, & 6 ***).

Presentation:

- You must be prepared to present your models and findings on the due date.

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Moon Study Instructions

The diagram below provides an overview of how to record data on the Moon Log Record Sheet.

- Fill in as much information as possible each day for 4 weeks.
- Fill in the Moon’s Orbital Position data for 3 days in a row at exactly the same time each day. (Top left hand corner of the log page.) → See below for instructions on using the clinometer to make these measurements.
- Fill in the Moon’s Inclination from South data at least twice a week for four weeks. (Bottom of the two rows in the middle of the page.) → See below for instructions on using the clinometer to make these measurements.

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Making and Using your Homemade Clinometer

Materials:
Protractor
2 paper clips
about 12 to 18 inches or more of string or thread
tape
piece of cardboard (a couple of inches larger than the protractor) in all directions
ruler or straightedge

• Tape protractor on the middle of the cardboard.
• Take straightedge or ruler and align $90^\circ$ mark and the middle of the hole at the bottom middle of the protractor. → Draw a vertical line on the cardboard.
• Poke a hole through the cardboard where the hole in the bottom middle of the protractor is located.
• Cut string in two pieces (one about 8 to 14 inches long and one about 4 inches long).
• Tie a paper clip to one end of each piece of string.
• Push the ends (without the paper clip) of each piece of string through the hole in the protractor (and cardboard) to that the paper clip hang down in front of the clinometer (protractor). Tie knots in the ends of the strings so that they will not pull through the hole in the cardboard.

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Instructions for using your clinometer to study the moon
(and other astronomical objects).

Materials:
• clinometer
• compass
• flashlight (if necessary)
• log sheet
• pen or pencil

For measuring the Moon’s directional movement:
• Use compass to find N, S, E, and W directions.
• Find moon in the sky.
• If the moon is south of the east-west plane, face south → east is to your left.
• If the moon is north of the east-west plane, face north → east is to your right.
• Hold clinometer at eye-level in front of you (towards the north or south, whichever way you are facing).
• Make sure the short string lines up with vertical line below the center of the clinometer.
• Hold paper clip on long string and point towards the center of the moon.
• Look at where this string crosses the degrees on the protractor. Record your measurement in degrees from the east
  ⇒ REMEMBER which way you are facing (north or south).
    • If you are facing south, the degree measurement you record is from the east.
    • If you are facing north, subtract the degree measurement from 180° to get the degrees from the east.

⇒ RECOMMENDATION:
  • Practice using your clinometer in your room or with trees or building outside.
  • Use the tops of trees or building or a ceiling light fixture in a room. Stand in different positions in relation to the object you are measuring, then try to find the degrees (angle) from your position to the object’s position.

For measuring the Moon’s inclination from the southern horizon.
• Use compass to find N, S, E, and W directions.
• Find moon in the sky.
• If the moon is east of the north-south plane, face east → south is to your right.
• If the moon is west of the north-south plane, face west → south is to your left.
• Hold clinometer at eye-level in front of you (towards the east or west, whichever way you are facing).
• Make sure the short string lines up with vertical line below the center of the clinometer.
• Hold paper clip on long string and point towards the center of the moon.
• Look at where this string crosses the degrees on the protractor. Record your measurement in degrees from the south.
  ⇒ REMEMBER which way you are facing (east or west).
    • If you are facing west, the degree measurement you record is from the south.
    • If you are facing east, subtract the degree measurement from 180° to get the degrees from