Why does the moon look different over time?

Introduction: We have all seen the moon in the sky. In fact, the appearance of the moon over time is the foundation for the Hebrew, Chinese, Islamic, and Hindu calendars, as well as most calendar systems used in antiquity. One reason for using the appearance of the Moon to mark the passage of time is that it follows a predictable pattern; but knowing the pattern does not explain the underlying cause of the pattern. So the real question is: ***Why does the moon look different over time?***

The Task: In this investigation, your group must develop an argument that articulates and justifies an answer to this research question using genuine evidence and appropriate reasoning. In order for your answer to be **sufficient**, it must explain **why** we see:

(a) The phases of the moon in the order we do;
(b) The moon rise and at different times of the day;
(c) Eclipses (both solar and lunar) on rare occasions; and,
(d) The same side of the moon each day.

Materials available for use: You may use the following materials during your investigation.

- Moon fact sheet
- Styrofoam balls and ping pong balls on sticks to use as model pieces
- A light source

Safety Precautions: There is no specific safety issues related to the materials that you will be using during this activity.

Getting Started: In order to complete the task outlined above, you will need to develop an explanation that answers the research question. However, before you can do this, you (and your group) will need to determine a way to gather the data you need develop your explanation and then use this data to produce evidence that can be used to justify your explanation. You will also need to make your rationale explicit by explaining why your data should count as evidence and why your evidence supports your explanation. You will then coordinate these components (explanation, evidence, and rationale) into an argument that you can use to convince your classmate that your ideas are valid and acceptable.

Interactive Poster Session: Once your group has completed your work, prepare a whiteboard that you can use to share and justify your ideas. Your whiteboard should include all the information shown Figure 1.

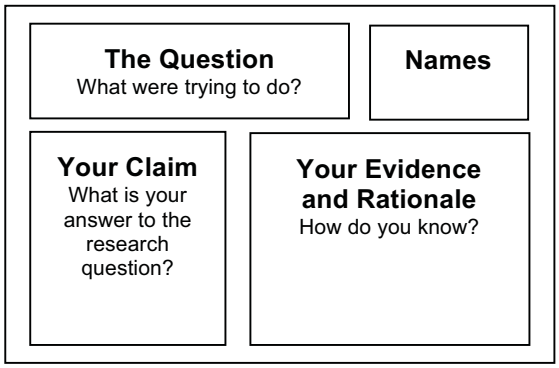

Figure 1: Information needed on a Whiteboard

To share your work with others, we will be using a **Round-Robin** format. This means that one member of the group will stay at your work station to share your groups' ideas while the other group members will go to the other group one at a time in order to listen to and critique the explanations developed by your classmates.

Remember, as you critique the work of others, you have to decide if their conclusions are valid or

acceptable based quality of their explanation and how well they are able to support their ideas. To do this, ask yourself the following questions:

- Is their explanation ***sufficient*** (it explains everything it needs to) and ***coherent*** (it is free from contradictions)?
- Did they use ***genuine evidence*** (they have data that shows a trend over time, a relationship between variables, or a difference between groups) and did they use ***enough evidence*** to support their ideas?
- Is their evidence of ***high quality***? In other words, is their evidence valid (they used appropriate methods to gather the data) and reliable (they attempted to reduce error in their measurements or observations)?
- Is there any ***counterevidence*** that does not support their explanation?
- How well does their explanation ***fit with other theories and laws*** that are used in science to explain or describe how the world works?
- Is their rationale ***adequate*** (they explain why the evidence was used and why it supports the explanation) and ***appropriate*** (rational and sound)?

Once the Round-Robin poster-session is complete, the ***Presider*** of the session (which might be your teacher or one of your classmates) will lead a discussion in an effort to synthesize all the various claims into one "class" explanation that is the most valid or acceptable way to scientifically explain *why the moon looks different over time*

Report: Once you have completed your research, you will need to prepare an ***investigation report*** that consists of three sections. Each section should provide an answer for the following questions:

Section 1: What were you trying to explain (or figure out) and why?

Section 2: How did you go about your work and why did you conduct your investigation in this way?

Section 3: What is your argument?

Your report should answer these questions in 2 pages or less. This report must be typed and any diagrams, figures, or tables should be embedded into the document. Be sure to write in a persuasive style; you are trying to convince others that your explanation is acceptable or valid!