November 8, 2016
BOCES/SU Educator Conference
Driver Middle School, Marcellus
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1. Title of Lesson: How can we develop a model that will show the lunar phases?

2. Brief description of the lesson: Students will apply their developing mental models of lunar phases to construct a conceptual model of the relationship between the Sun, Moon and Earth to depict one or more of the lunar phases.

3. **Research Theme:**
The central theme in the research lesson addresses the construction of models. Scientists create both mental and conceptual models. These two kinds of models are informing each other because they are interrelated.

Mental models are functional, personal, and at the same time incomplete. They provide scientists with a tool for making sense of and developing their predictions about a phenomenon. This type of model depends on the individual's current understandings and misconceptions of a phenomenon.

Conceptual models, the kind of model we are explicitly addressing in this lesson, are cognitive tools that attempt to demonstrate a phenomenon more precisely. Conceptual models are constructed to represent mental models in a physical, concrete manner. This kind of model enables scientists to visualize a phenomenon more effectively to understand its components in more depth and with increased clarity.

Conceptual models can include diagrams, physical replicas, mathematical representations, analogies and computer simulations. Conceptual models attempt to mirror the actual phenomenon as closely as possible; however, models have limitations. They help students revise previous ideas behind a phenomenon potentially leading to more complete understandings that can improve their scientific reasoning. Models can be assessed for effectiveness and revised when necessary (Framework, 2012).

In this lesson, we are asking our students to develop a physical replica that will ultimately, over time, deepen their understandings of the relationships within the Sun-Moon-Earth system. The physical replica in this lesson relates to the Moon's positional relationship to the Earth and Sun and it is intended to demonstrate how the lunar phases are viewed from Earth.

The new New York State Science Learning Standards, which are heavily based on the NGSS, are about to be adopted. This will require new ways of thinking about how teachers teach and students learn science. A key theme throughout the standards is the development of models that show their understanding of a concept. For students to develop an accurate model, they reveal their understanding of the phenomenon.

Research Hypotheses:

1) If we provide our students with building materials (sticks of various lengths, small foam ball, lamp, holes in a plastic tray), and intentionally refrain from providing direction to guide their thinking for at least 10 minutes, they will be unable to complete the model of the lunar phases. However, we believe they will begin to express their logistical and conceptual misunderstandings to each other during their collaboration. In this way, students will provide us with rich information to guide and inform our future lessons on this abstract topic.

2) If we provide our students with limited directions, by the end of the lesson they will successfully construct a model that accurately represents the positions of the Full and New Moons.

3) If we offer our students adequate space to write, they will take advantage of this space to express their understandings and misconceptions about constructing models about the lunar phases.

4. **Unit Goals:** (STC: My Generation, Space Systems Exploration, 2015)

Students will be able to:

a. Analyze scale properties within the Sun-Moon-Earth system.
b. Use a model of the Sun-Moon-Earth system to describe the cyclic patterns caused by Earth and Moon orbits as well as the rotation of these bodies.
c. Relate the patterns in the motion of Earth and the Moon with the Gregorian calendar.
d. Calculate time in terms of distance traveled around the Sun and revolutions of the moon.
e. Construct and use a model to understand how the Moon reflects sunlight as it orbits Earth.
f. Use a model to explain how the relative positions of the Sun, Earth, and Moon change the Moon's appearance.

g. Analyze the Moon's appearance in relation to the cyclic pattern of lunar phases.
h. Identify and name the phases of the Moon.
i. Use models to visualize why only one side of the moon ever faces Earth.
j. Use model observations to develop explanations for the occurrence of full moons ad new moons.
k. Evaluate model limitations and suggest possible improvements.
l. Analyze data tables to detect patterns in tidal and lunar data.
m. Apply appropriate graphing techniques to answer questions about tidal lunar data.
n. Develop a model to represent the Sun-Moon-Earth system's effects on tides.
o. Use a model to understand the influence of the Moon and Sun on tides.
p. Use a model of the Sun-Earth Moon system to analyze the patterns of shadows during eclipses.
q. Examine the frequency of eclipses.
r. Construct and use a model of Earth's orbit around the Sun to describe the cyclic patterns of the seasons.
s. Use a model to investigate the effect that Earth's tilted axis has on the amount of solar radiation hitting the Earth during different times of the year.
t. Determine an appropriate scale factor for a model of the solar system.
u. Apply a scale factor to solar system.
v. Develop a scale model of the solar system and use the model to explore relationships among the Sun and planets.
w. Use a model to predict the climate on different planets.
x. Develop a research question about Jupiter and its four largest moons.
y. Develop and use a model to explain findings.
z. Formulate a scientific explanation from evidence
aa. Construct, analyze and interpret graphical evidence to construct scientific explanations about surface gravity.
bb. Construct scientific arguments about gravitational interaction in the solar system.
cc. Use a model to examine the relationships among relative body mass, distance and speed of an orbiting body.
dd. Construct an explanation for how gravity controls a planet-moon system.
ee. Analyze and interpret images to determine the scale properties of surface features on Mars.
ff. Compare the relative sizes of surface features on Mars and Earth.
gg. Use evidence from Mars photographs and Earth geologic processes to develop scientific arguments for or against the presence of water on Mars.
hh. Develop an argument, using supporting facts, for or against human habitation of space or other planets.

ii. Define criteria and constraints that a design for human habitation on Mars must meet to ensure astronauts' survival.
jj. Plan and design a model with solutions to meet each criterion of the design problem. Create and use feedback to generate solutions and improved model design.
kk. Generate ideas for using models to test design elements.

5. Lesson Goals:

1) Students will construct a conceptual model based on their collective mental models of the Sun, Earth, and Moon System. Students will use this model to:

- To develop their understandings of how the Moon reflects sunlight as it orbits Earth.
- To explain how the relative positions of the Sun, Earth, and Moon change the Moon's appearance.
- To analyze the Moon's appearance in relation to the cyclic pattern of lunar phases.
- To locate the positions of the Moon, Earth and Sun during its New Moon and/or Full Moon phases

(STC: My Generation, Space Systems Exploration, 2015)

6. Relationship of the Unit to the Standards

Related prior learning standards	Learning standards for this unit	Related later learning standards
First Grade **Space Systems: Patterns and Cycles** **1-ESS1-1. Use observations of the Sun, moon, and stars to describe patterns that can be predicted.** **ESS1.A: The Universe and its Stars** Patterns of the motion of the sun, moon, and stars in	**MS-ESS1-3.** **Develop and use a model of the Earth-Sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the Sun and moon, and seasons.** **ESS1.A: The Universe and Its Stars** Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed,	**HS-ESS1-7.** **Construct an explanation using evidence to support the claim that the phases of the moon, eclipses, tides and seasons change cyclically.** **ESS1.B: Earth and the Solar System** Kepler's laws describe common features of the motions of orbiting objects,

the sky can be observed, described, and predicted. (1- ESS1-1) **Grade 5** **Space Systems: Stars and the Solar System** **5-ESS1-2. Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.** **ESS1.B: Earth and the Solar System** The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year. (5-ESS1-2)	described, predicted, and explained with models. (MS-ESS1-1) This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short- term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year. (MS-ESS1- 1) **MS-ESS1-2 Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.** **MS-ESS1-3 Analyze and interpret data to determine scale properties of objects in the solar system**. **ESS1.A: The Universe and Its Stars** Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. (MS-ESS1-1) **ESS1.B: Earth and the Solar System** Earth and its solar system	including their elliptical paths around the sun. Orbits may change due to the gravitational effects from, or collisions with, other objects in the solar system. (HS-ESS1-4) (NYSED) Earth and celestial phenomena can be described by principles of relative motion and perspective. (HS-ESS1-7)

	are part of the Milky Way galaxy, which is one of many galaxies in the universe. (MS-ESS1-2) (NYSED) The solar system consists of the Sun and a collection of objects, including planets, their moons, comets, and asteroids that are held in orbit around the Sun by its gravitational pull on them. (MS-ESS1-2),(MS-ESS1-3)	

7. Background and Rationale:

One of the significant shifts in the new standards is providing opportunities for students to construct models to produce explanations of phenomena based on evidence. The standards require teachers to alter their orientation towards direct instruction and demonstrations intended for confirmatory instruction. The new instructional shift is having students engage in constructing models as a cognitive tool for their sense-making. This lesson empowers our students to use their collective knowledge, through collaborative discussions, to make physical representations of their personal, incomplete mental models. We believe this lesson gets at the heart of the standard that has driven our research lesson.

While students are engaged in the practice of modeling, they construct an explanation of the phenomena. Modeling is not easy! However, it has the potential to foster deeper understandings in our students as opposed to the instructional techniques that require students to regurgitate an explanation given to them by a textbook or a teacher. Providing students with activities specifically designed for constructing models, while simultaneously providing them with a safe emotional environment to explain their thinking, can be an effective way of revealing student thinking. As students unveil their knowledge, their incomplete understandings, or their misconceptions, it provides us with authentic data to reflect on task design, instructional practices, or to develop further learning opportunities for our students in future lessons.

An issue that often perplexes teachers is that of when and how much to let students struggle with their thinking before they intervene and provide scaffolding to bring students to understanding in regards to the goals of the lesson. Our group had this in mind as we developed this open research lesson. The team had grappled with how much direction to give the students as far as constructing the model and ultimately decided against telling them where to position the flashlight that would represent the sun.

Unique to our lesson, we determined that students would need some basic understanding of the Sun-Moon-Earth system before they could attempt to develop and create the model. We divided the lesson into two segments. The first segment includes whole group discussion, a short time-lapse video, and a card sequencing activity. We taught the first segment of the lesson before November 8. The second segment of the lesson provides the focus of our research lesson. This part of the lesson involves students constructing conceptual models.

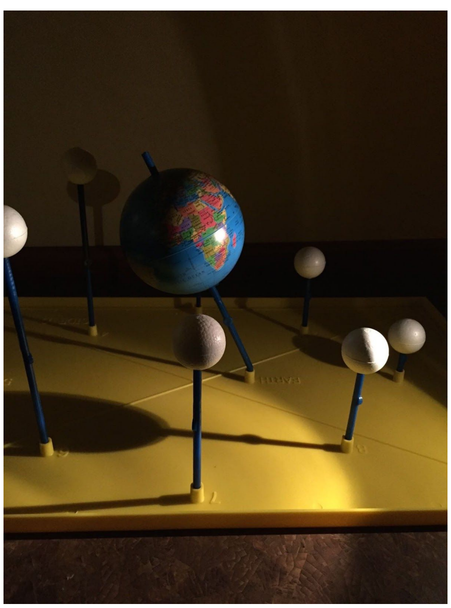
The first segment includes a discussion designed to uncover student thinking in regards to prior knowledge, misconceptions and general ideas about lunar cycles. We offered the students the opportunity first to write their thinking about lunar phases before we began the discussion. Our rationale for providing writing time was to provide the students time to organize their thoughts before they spoke; we thought this could foster a more productive discussion. We also thought we would address the affective component inherent to public discourse. We realized that reluctant speakers might be more inclined to participate if they had their thoughts written down before the discussion. We wanted to include as many students as possible in the discussion. During the discussion, we publically recorded student ideas on chart paper to keep a historical record and to provide a focus for the discussion.

The next part of the lesson we showed a short, time-lapse video demonstrating the predictable cycle or patterns of changes of the Moon over time. We played the movie twice. During the second showing, the students observed the changes in slow motion; we thought this would enable the students to see the phases more clearly and further inform their thinking. We required the students to record what they noticed on a notebook page that we iteratively created. (see both iterations of the notebook pages in the appendix) As a full group, we recorded observations on chart paper.

In last part of the first segment of this lesson, we wanted to increase their understandings by providing them a set of pictures that depict each of the lunar phases.

We asked the students to work in small groups (3 or 4 students). Their task was to work collaboratively to place the lunar phases in order according to what they observed in the video. In both iterations of this part of the lesson, we noticed the students were able to complete this task efficiently. We believed that both the video and the sequencing card activity either reinforced their existing mental models of the lunar phases or possibly expanded their knowledge to some extent. We thought these two tasks would provide them with more experience, or more information to increase their capacity to engage in the challenging cognitive task of constructing conceptual models in the second part of the lesson.

The second phase of the lesson, conceptual model construction, is the focus of the November 8th research lesson. The first iteration of this part of the lesson was a fascinating exercise. We provided the students with materials furnished by the STC kit including eight styrofoam Moons to be mounted on eight sticks that were numbered and corresponded to numbered holes on the model board. We also provided them with a small flashlight that served as the Sun. Before the lesson, we mounted the Earth in its correct position on the model. We also placed a small sticker on the Earth for students to recognize the location of New York State. We did this to assist the students in their awareness of the visual perspective of a person viewing the Moon from Earth. We believed it was critical for the students to understand the point of view of a person observing the Moon from Earth. We asked the students to place the materials in their appropriate positions according to the logical sequence of events that occur in the lunar phases.



In the first delivery of the lesson, we determined that the flashlight was too dim to show what we wanted them to see clearly. Perhaps more importantly, students had to move the flashlight to see a new phase. The team determined that this action did not relate to the stationary sun in our solar system. (See picture of first iteration).

To improve the lesson, we practiced using several different light sources to assess different illumination strengths. We thought that a clamp light would be best. We also believed that we needed to position the clamp light mounted on test tube stand roughly three inches from the table. We will instruct the students to not touch or move the lamp for both safety reasons and to reinforce the fact that the sun's position is consistent in this system. In a further attempt to keep students safe, we decided to provide the students with sunglasses. In this way, we could provide the students with another layer of protection. The clamp lights provide intense light. If students continually gaze into the lamp, it may cause eye irritation and impact their observational abilities. We hope the students do not become too distracted by this newly acquired fashion accessory.

We do not anticipate that all students will be able to construct the model correctly during their first attempts. Further instruction will likely be required, and follow-up lessons are planned going forward. The new standards encourage teachers to shift their thinking from making a model as an end of the unit project, as in the past, to using models to help students develop their understanding. Moreover, the standards encourage teachers to allow our students to “fail forward," or struggle with the ideas and concepts in science. Like the students, we teachers felt conflicted over how much support to offer and how much space should we provide for our students to struggle with "failing better". This aspect of the shift to the new standards took up a lot of our intellectual energy. We consulted our science expert about our pedagogical challenge. We decided that the best course of action would be to provide the students with the materials and for the most part, let them construct their models. If we scaffold too much, then our students will not be practicing the standard driven goals of this lesson. With this in mind we altered our research lesson in the following ways:

- We covered the numbers on the eight sticks and the numbers near the holes on the model board. We wanted the students to struggle deciding where to position the Moon in patterns representing the lunar phases.
- We provided larger lamps to replace the smaller flashlights used in the preliminary lesson. We secured each lamp to a post 3 inches above the table (see above discussion).
- Students will only receive one “Moon” to use in their models. They will need to transfer the one “Moon” to each stick.
- We broke the lesson into two segments to allow more time for the students to engage in the practice of model building.
- We altered our student notebook pages to provide more writing space for students to describe their observations.This tweak was designed for the students’ convenience and for teachers to collect data to inform later lessons (see appendix).
- At the beginning of the lesson, we will give students the opportunity to manipulate their materials with no guidance about how to place the materials on the model board. After this initial experience, we will provide scaffolding in the

form of generalized questions. As an additional scaffolding strategy, we will require groups to position New Moon or Full Moon correctly on the board before the lesson ends.

- Questions will be used to guide the group's collective thinking. However, we will not ask questions during the lesson that could be veiled answers to problems the students are experiencing. The questions or comments from the teacher will be intended to offer students encouragement to think and persist as the endeavor to solve the unique problems that will arise in each group of students.

We will allow our students to do this for a time and then provide some scaffolded instruction so they can move toward success. We will likely ask students to find one phase first. In general, we think students know how to position the materials to create Full Moon, so this will be the likely choice. As the groups are successful with that task, we will encourage them to position other phases of the Moon in their models. This model building activity is a challenging task both conceptually and logistically. We understand that at twelve years old, with little prior knowledge, students will likely need more than one opportunity to develop their thinking about constructing conceptual models.

8. Research and Kyouzai kenkyuu

In researching the topic of using models to help students create an understanding of the Sun-Earth-Moon relationship, we first consulted the Next Generation Science Standards to examine the standard and develop our understanding of the Sun-Earth-Moon system.

We then consulted a member of our team, Heidi Busa, who has experience teaching high school Earth Science for clarification of principle concepts involved. Two other teachers on our team have experience teaching this content. Together, these team members were able to make the content clear to all. We realized that this is difficult content even for adults and we were especially mindful of that when planning or lesson for children.

Once we were clear about the content, we began to explore the materials in the STC Space Systems Exploration unit produced by the Smithsonian Science Education Center. This unit contained a lesson entitled Howling at the Moon that would allow us to address the standard. We read through the lesson and once again relied on the team members who were familiar with the content.

Our original thoughts were to use claims and evidence in the process of addressing the standard, so we examined the book, What's Your Evidence by Carla Zembal-Saul, Katherine McNeil and Kimber Hershberger (2013). It is important for students to learn to make claims and support them with evidence from data, as this is a skill that crosses disciplines and is used in everyday life. In this book, the authors explain,

> When emphasis is placed on evidence and explanation, children can develop meaningful understandings of science concepts, consider the important role of evidence in science, recognize science as a social endeavor through which explanations are changed in light of new evidence, and participate productively in a classroom community of scientists. (p. 15).

While the team recognizes the importance of claims and evidence, we decided to focus only on the development of the model for this lesson and keep the concepts of claims and evidence we were learning to guide our whole group discussions. We decided to foreground our lesson on model construction.

We then moved on to examine the materials provided by the Smithsonian and began to study and explore with the model. We had a difficult time with the materials at first, as the light shining on the representations of the moon was difficult to get positioned correctly. It was at that point we met with an expert from Syracuse University, Dr. Sharon Dotger, who added further explanation to how we should approach using the model with our students. She also helped us shape our focus question for the lesson.

The team has spent numerous meetings working with the model to determine how much direction and support to offer students and how much to let them struggle. The focus of the NGSS is on student development of their understanding through the use of models. This is an important shift away from current practices and will require teachers to let their students struggle and "fail forward" which will ultimately result in deeper understandings of the science concepts.

In our earliest discussions, the lesson study team first thought we would approach this standard in a way that also involved students making claims and providing evidence for those claims. This required much discussion among the team members surrounding first, what constitutes a claim and what is evidence and the upon further discussion, what would we anticipate students would say. Working backward, we looked at what students would need to know and be able to do to create claims and evidence as it relates to the model.

Given the complexity of this concept, we determined that our best approach was to concentrate on student development of the model only and could incorporate claims and evidence in future lessons once students had a better understanding. The work for this particular lesson then became focused on student understanding of the phenomena in such a way that they could attempt to show their thinking through model construction.

In lesson study, the work of the researchers is first to reveal their understandings and misunderstanding about the phenomena to be presented to the students. Teachers unveiling their misconceptions about content to each other can be a difficult interpersonal task for members of a team. However, our team members had worked together for quite some time in various capacities. We also created norms that guided our collaborative work, which allowed us to reveal our understandings and misunderstandings in an atmosphere of trust and respect. It was helpful for our particular team that we had a high school Earth Science teacher, and two elementary teachers on the team who had taught the science content previously and those colleagues, along with experts in the field from SU, helped the rest of the team deepen their understanding and clear up misunderstandings. As we progressed through the lesson development process, the team revisited their thinking about the Sun-Earth-Moon system time and time again. We spoke freely, asked questions regarding the content, and understood how important it was for us as members of the team to know the content before we could be responsible for teaching it to our students.

9. Unit Plan

Lesson	Task
1 Calendar in the Sky: Introducing the Sun-Earth-Moon System	Students use a model to study the periodicity of the orbits of Earth and the Moon and How their orbits relate to the Gregorian calendar.
2 RESEARCH LESSON Howling at the Moon	Students use a model to investigate changes in the appearance of the Moon as it orbits Earth and how these changes relate to the positions of the Sun, Earth and Moon.
3 Pulling Water: Gravity and Tides	Students analyze tide chart and moon phase data to infer how the lunar cycle affects tides.

4 Blackout: Solar and Lunar Eclipses	Students use models to investigate how the arrangement of orbital planes, within the Sun-Earth-Moon system, creates the special circumstances needed for eclipses to occur.
5 Reasons for Seasons: Why earth's Tilt Matters	Students use a model to investigate how the tilted axis of Earth causes changes in the distribution of solar energy on Earth's surface as Earth orbits the Sun.
6 Stellar Proportions: Modeling the Solar System	Students develop scaled plan-view and side-view models of the solar system and use them to make predictions about the seasonality of climates on other planets.
7 Jupiter and Its Moons	Students develop and use models of Jupiter and its four largest moons to explore research questions.
8 Gravity: Bending Space-Time	Students compare the weight of an object on different planets with respect to planet mass. They use a simple physical model to investigate how gravity affects objects of different mass.
9 Geologists in Space: Searching for Water on Mars	Students analyze pairs of images from Mars and Earth to interpret various geologic features potentially related to surface water. Students use textual evidence about how water shapes Earth and photographic comparisons of Earth and Mars features to develop scientific arguments for why Mars does or does not have water.
10 The Challenges of Space Exploration	Students design human habitations for Mars by analyzing planetary conditions, developing design criteria, planning and modeling design solutions, and evaluating competing designs.
Assessment Lesson	Students develop a scale model of Uranus and its five largest moons and use it to make predictions about the moons' gravities, orbital speeds and eclipses. Students also analyze the model's ability to demonstrate other aspects of the

	Uranus-moons system including scale properties, axial tilts, orbital properties, lunar phases, and seasons on the moons. In the second part, students complete a Written assessment covering the performance expectations, disciplinary core ideas, crosscutting concepts, and science and engineering practices covered in the unit.

10. Design of the unit and lesson

A. The Science

This lessons in this unit have been designed to follow a carefully constructed path which builds on student understanding and skills using an inquiry approach. Specifically, each lesson is constructed to align with the Next Generation Science Standards (NGSS) and addresses disciplinary core ideas, crosscutting concepts and engineering practices delineated in the NGSS. Each lesson follows a learning progression that builds on skills and concepts from previous lessons. This is reinforced in the research lesson where students build on their knowledge from previous lessons.
As stated in the NGSS students will engage in:

Science and Engineering Practices:

Designing and using models (Sun-Earth-Moon)
Engaging in argument from evidence. (model)

Disciplinary Core Idea:

The universe and its stars

Crosscutting Concepts

Patterns (Moon's cyclical pattern)
Cause and effect (Rotation and revolution)
Systems and system models (Sun-Earth-Moon)
Connections to nature of science: Scientific knowledge assumes an order and consistency in natural systems.

B. Cognitive Demand

In designing this lesson, careful attention was paid to be sure all students could be actively engaged. The building of models to gain and show understanding is a new skill and so is cognitively demanding. The fact that the students received appropriate background information in multiple modes contributes to the higher likelihood of success and the scaffolding activities provided after several minutes of struggle leads to deeper understanding of a rather difficult topic as opposed to a high level of frustration.

C. Access for All Students

The authors of the NGSS intended to provide science instruction that is accessible for all students. The structure of the lesson ensures that students can be successful at the task at least in building a conceptual knowledge base about lunar phases. Visuals have been provided using multiple means and students have access to them throughout the lesson. Independent work on the notebook page, small group, and large group discussions allow students to hear others' ideas as well as share and justify their own. The model allows students to test their ideas and change positions of the components easily to try new ideas when their previous ideas prove to need correcting. These strategies will lead to multiple paths to understanding.

D. Agency, Authority and Identity

In designing this lesson, the team was careful to be sure students had enough background to create the model. However, the team was equally careful to be sure that the learning would be in the hands of the students and the model created would come from synthesizing their learning from prior lessons. Team members planned a method of scaffolding student learning but only after students had engaged in a forward moving "struggle" with the problem of creating the model. The plan for allowing students to move forward was to stop after a few minutes and ask students to create either a model of a full moon or new moon, thinking that these would be the moon phases students would be more likely to understand how to produce before the other phases. Probing questions from the teacher were developed to spur student thinking. "Let's think about what we know about the new moon or full moon," and, "Think about how the moon must be illuminated for us to be able to see it from here." With this approach along with their recording sheet, students can solidify their thinking and move on to other phases. Ultimately the development of the model and with it the learning belongs to the student.

E. Use of Assessment

The use of the student notebook page, along with the model development, provide an ongoing formative assessment. Teacher observations and data collection, class discussion, and individual work on the notebook pages provide feedback to the teachers on student progress. These assessment devices provide us a window to view their understandings about the relationships between positions of the Sun, Earth, and Moon in regards to the Moon phases that are seen from Earth. Teacher observation of student development of the model allows for a timely re-group and a scaffolding suggestion of just finding the full moon or new moon to keep students from frustration and keep them thinking forward. Collection and examination of the notebook pages will offer more information to the team about the progression of student understanding over the course of the lesson. An end of unit assessment in the form of a performance task will present an opportunity for students to show how they have processed and synthesized their learning from the unit.