

Hypothesis # 1 If we provide our students with building materials 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.

Hypothesis # 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.

Hypothesis # 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.

Teacher Work	Student Work	Observer Work	Notes
Remind students of the focus question: How do we make a model of the Earth-Sun-Moon system that shows the patterns in the moon's cycle?	Listen		
Review the main ideas from the first segment of the lesson using the charts and cards that have been attached to the white-board prior to the lesson.	Listen to classmates and participate in a brief discussion about the activities experienced in the first segment of the lesson (time-lapse movie, lunar phase card sequencing). Refer to your packet or the charts and cards on the whiteboard.	What do students say about the lunar phases?	

<p>Initiate a brief discussion by asking the question: What comes to mind when you think of the word "model"?</p>	<p>Discuss ideas or explain what you know about models.</p>	<p>What ideas do students share about models?</p> <p>How do students define models?</p>	
<p>Direct students' attention to their science packets and the planning question: Using the materials in front of you, how might you construct a model that shows the Earth-Sun-Moon system?</p>	<p>In collaborative groups, brainstorm and record in packet how to use the materials to build a model of the lunar phases.</p>	<p>Refer to Hypotheses 1 & 3</p> <p>What are students saying about the materials and how they can be used to represent the Earth-Sun-Moon system?</p> <p>Note anything you find interesting in either their drawings or written ideas.</p>	
<p>Using the materials provided, how can you demonstrate the various phases of the moon? Remember to think about how your model moon should</p>	<p>Collaboratively build a model using the materials provided. In packets record observations or thoughts by drawings or writing.</p>	<p>Refer to Hypotheses 1 & 3</p> <p>Is the group's plan being enacted in the way they intended?</p> <p>How has the group deviated from the plan?</p>	

<p>look from your model earth.</p> <p>Intentionally refrain from providing direction to guide their thinking for at least 10 minutes.</p> <p>Walk among students to observe their progress and notes the variety of strategies students employ.</p> <p>Intentionally refrain from interacting with students for approximately 10 minutes.</p>		<p>What is being said about the construction of the model?</p> <p>Note anything you find interesting in either their drawings or written work.</p> <p>How are the students handling this challenge emotionally?</p>	
<p>Briefly stops the activity to discuss what the students are noticing about their models. Validate the difficulties involved in the challenge of building models with little direction.</p>	<p>Students stop model construction to participate in brief whole group discussion.</p>	<p>What are students saying about the activity?</p> <p>What are they saying about lunar phases?</p>	

<p>Provide scaffolding by asking students to model the position of the Full Moon or the New Moon.</p> <p>The teacher walks among students to provide encouragement as they fail forward. Teacher asks general questions focused on asking the students to share their thinking without giving them directives on how to build the model.</p>	<p>Students return to the task and work to model the position of Full Moon or New Moon</p> <p>Students write or draw their observations in packet</p>	<p>Refer to Hypothesis 2</p> <p>Are students able to model the position of the Full Moon or New Moon in the system?</p> <p>What are they saying to each other about manipulating the materials?</p> <p>How did the students react to the limited directions?</p> <p>Do you see evidence that students are furthering their understandings of lunar phases? Building models?</p>	
<p>Direct students to stop working on their models and facilitate a discussion about the models and modeling process. Provide the opportunity for the students to describe their thinking using</p>	<p>Students participate in a discussion about their models. Students provide a description, analysis or manipulate the model located in the front to the room to explain their model.</p>	<p>Refer to Hypothesis 2</p> <p>Do you see evidence of students furthering their understandings of the positions of the New Moon or Full Moon?</p> <p>Did the model in the front of the room enable students to share their</p>	

<p>the model located at the front of the room.</p>		<p>thinking with the larger group effectively?</p>	
<p>Direct students' attention to their notebook. Directs students to reflect on their experience by writing with the following prompts: What part of using the model was helpful in your understanding of the patterns in the Moon's cycle? What part of using the model was difficult or confusing?</p> <p>To conclude the lesson, facilitate a brief discussion about reflections.</p>	<p>In notebook, write reflections about experiences of the lesson using the prompts provided</p> <p>A few students share their reflections with the larger group.</p>	<p>Refer to Hypothesis 3</p> <p>What misconceptions about lunar phases are presented in the discussions?</p> <p>What confused the students about constructing the model?</p> <p>Was there evidence the model was helpful to students?</p> <p>What do students understand about building models of lunar phases? What confuses the students about this model?</p>	