Consider two vignettes about some lessons on moon phases:

1

In Ms. Y's class the students come into class to find that the topic for the day is Moon phases. The day before students had learned the order of the planets from the Sun and had made a chart about some of the key characteristics of each planet. The teacher tells the students that today they will learn about Moon phases. She asks the students to raise their hands and tell the class one thing they know about the Moon. Students say things like, "I know that we've sent rockets to the Moon" and "Isn't the Moon involved in tides?" After 3 or 4 students have shared, the teacher puts up a list of 8 Moon phase names. She asks the students to clear a space in the center of the room and she chooses 8 students who are each given a piece of paper with a Moon phase label on it. She also picks one student to represent Earth. She points out to the students that she has drawn a sun on the front board and she goes on to tell each student who is holding a label where to stand for his/her phase beginning with the new Moon. As she places each student she says a few words about the phase. Once all 8 students are standing in the proper order around the Earth she has all the students work individually to label a diagram she has passed out showing the 8 phases in a circle around the Earth. Next she gives each pair of students a Styrofoam ball and a flashlight. She turns out the light and has the students spend about 5 minutes taking turns demonstrating the cycle of Moon phases. At the end of the activity she assigns students to make 8 flashcards that evening with a picture of the phase on one side of the card and the name of that phase on the other. She lets them know that they will have a quiz the following day on this material and on the planets from the previous day.

2

The students in Mrs. X's class have been working on near-Earth astronomy for several days prior to this lesson. By examining and wondering about the pattern in Moon rise times over the course of a month, they have established that the Moon orbits the Earth in the same direction as the Earth spins and it takes about a month to complete one orbit. Each day they have also spent a few minutes collecting observations about the Moon's appearance and they have recorded data about both the changes in the shape of the Moon and the times of day that the Moon is visible. Throughout the month as they've made these observations the teacher has provided the students with the name of each different phase when it became relevant. From these observations and with assistance from their teacher they have articulated a driving question of: "Why does the appearance of the Moon change over the course of the month?" With this question in mind their teacher gives each group of students a Styrofoam ball and explains that their task will be to use the ball to represent the Moon by sticking it onto a pencil. She has mounted a bright light to the ceiling and it is the only light in the room because she has covered the windows. She explains that this light will be the Sun. Their task will be to use the ball and their own bodies to simulate the Moon's orbit around Earth (recalling what they had already figured out about that from the moonrise times). In each group one student will represent Earth and will slowly move the Moon around demonstrating the orbit and the other students in the group will stand directly behind that student so they see what s/he sees. As they simulate the orbit the teacher directs the students to observe how the Moon looks during the entire orbit. Once they have all seen this several times she asks them to draw a representation on their white boards that shows why the Moon's appearance changes over the course of the month, making sure to label each Moon phase name in the appropriate place. Once each group has finished their boards she has the group do a gallery walk so they can see what others have done. As a class they decide on a consensus representation and their homework for the day is to write a short paragraph that they could use to explain to their mother why we see phases of the Moon from Earth.