

Grade 4-12 Student Conceptions of Astronomical Phenomena

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National Science Foundation
WHERE DISCOVERIES BEGIN

DUE-0962792

What should students know?

The Physical Setting > Solar System Print view Link to this page

View Research on Student Learning over millions of years.

6-8

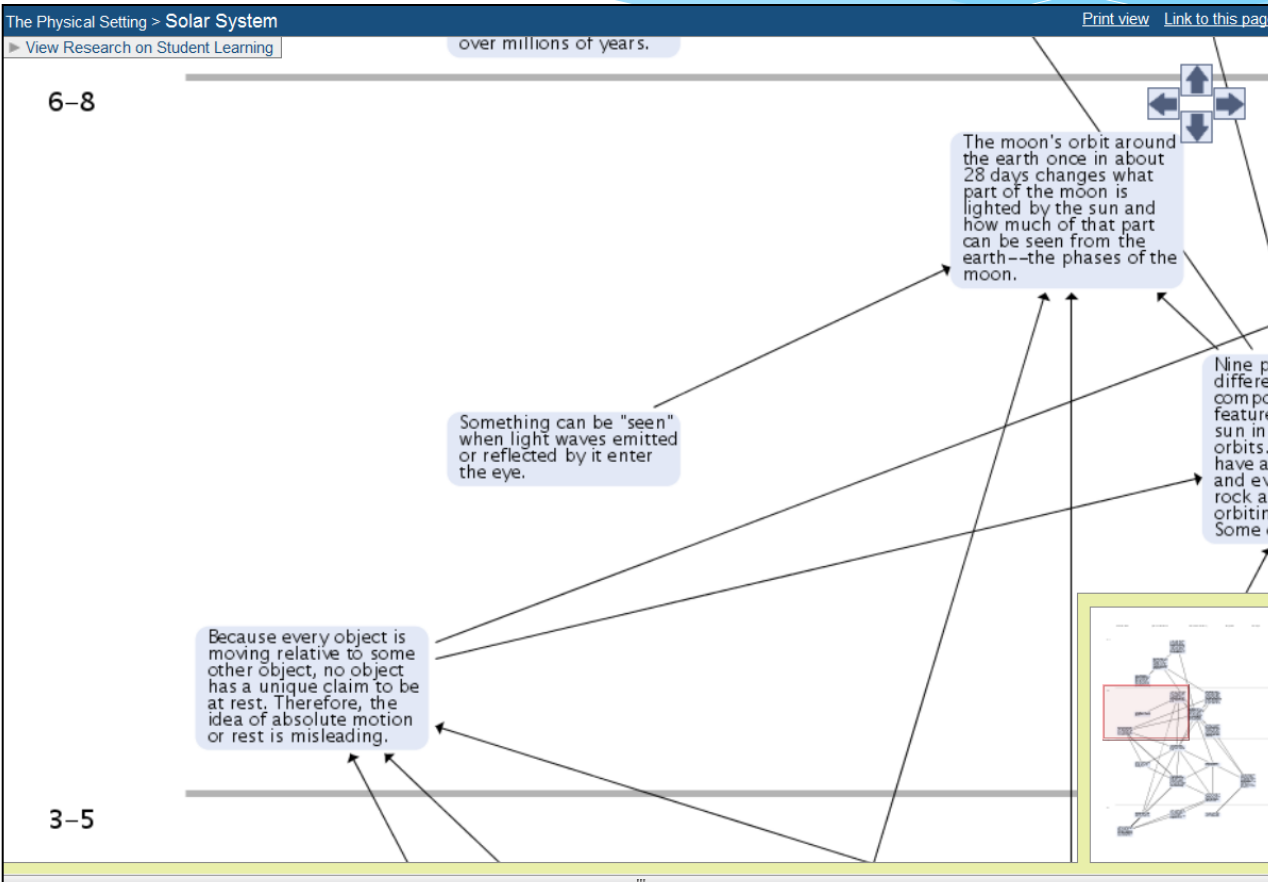
3-5

Something can be "seen" when light waves emitted or reflected by it enter the eye.

Because every object is moving relative to some other object, no object has a unique claim to be at rest. Therefore, the idea of absolute motion or rest is misleading.

The moon's orbit around the earth once in about 28 days changes what part of the moon is lighted by the sun and how much of that part can be seen from the earth--the phases of the moon.

Nine planets have different compositions, features, and orbits. Some have a volcano and even a rock and are orbiting. Some of



The screenshot displays a digital learning tool interface. At the top, there is a title bar with the text "The Physical Setting > Solar System" and navigation options "Print view" and "Link to this page". Below the title bar, there is a search bar containing the text "View Research on Student Learning" and a secondary search bar with the text "over millions of years.". The main content area is divided into two horizontal sections. The upper section is labeled "6-8" and contains a text box that reads: "Something can be 'seen' when light waves emitted or reflected by it enter the eye." The lower section is labeled "3-5" and contains a text box that reads: "Because every object is moving relative to some other object, no object has a unique claim to be at rest. Therefore, the idea of absolute motion or rest is misleading." To the right of these text boxes is a network diagram consisting of numerous nodes connected by lines. A red rectangular box highlights a specific cluster of nodes within the network. Several arrows originate from the text boxes and point to various nodes and edges in the network diagram. In the bottom right corner, there is a small inset window showing a zoomed-in view of the network diagram, with the red box from the main diagram visible within it.

<http://strandmaps.nsd.org/?id=SMS-MAP-1282>

What should students know?

- * **NSES Content Standard D Earth and Space Science Standards**
 - * *Earth in the solar system*
 - * Most objects in the solar system are in regular and predictable motion. Those motions explain such phenomena as the day, the year, phases of the moon, and eclipses.

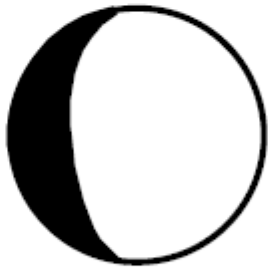
What should students know?

By the end of grade 5. 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 and seasonal changes in the length and direction of shadows; phases of the moon; and different positions of the sun, moon, and stars at different times of the day, month, and year.

Some objects in the solar system can be seen with the naked eye. Planets in the night sky change positions and are not always visible from Earth as they orbit the sun. Stars appear in patterns called constellations, which can be used for navigation and appear to move together across the sky because of Earth's rotation.

How do students progress from novice to expert understanding?

3. On a night when the right side of the Moon is mostly illuminated as seen from Earth (see picture below), how would the Earth appear in the sky to an astronaut standing on the lit side of the Moon?



Moon

Phenomena
Cross-Cutting Themes

Diurnal Motion
Pattern

Lunar Phases
Scale

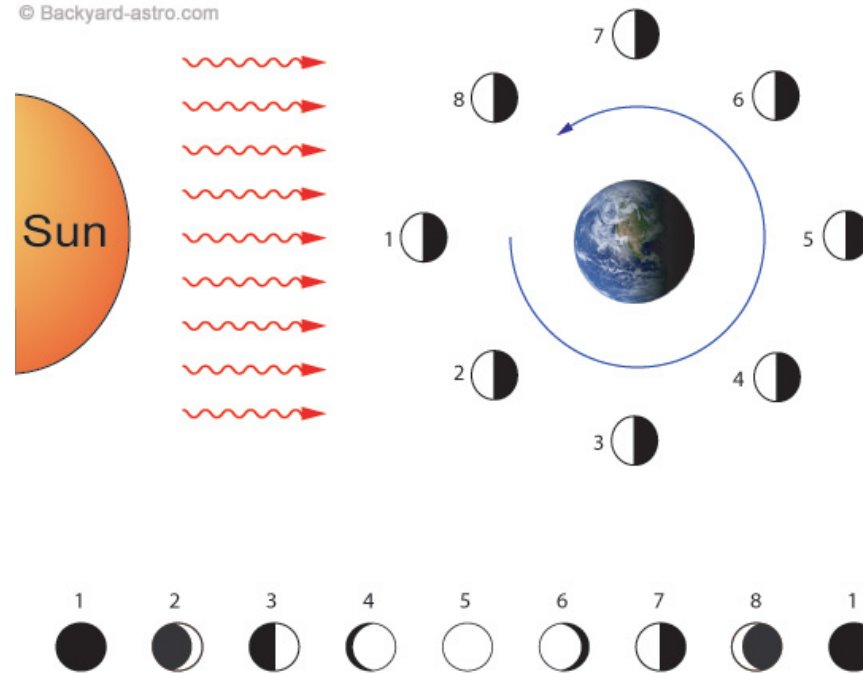
Seasons
Time

Season Change in Stars
Motion

Planetary
Position & Relations

Experts Definition

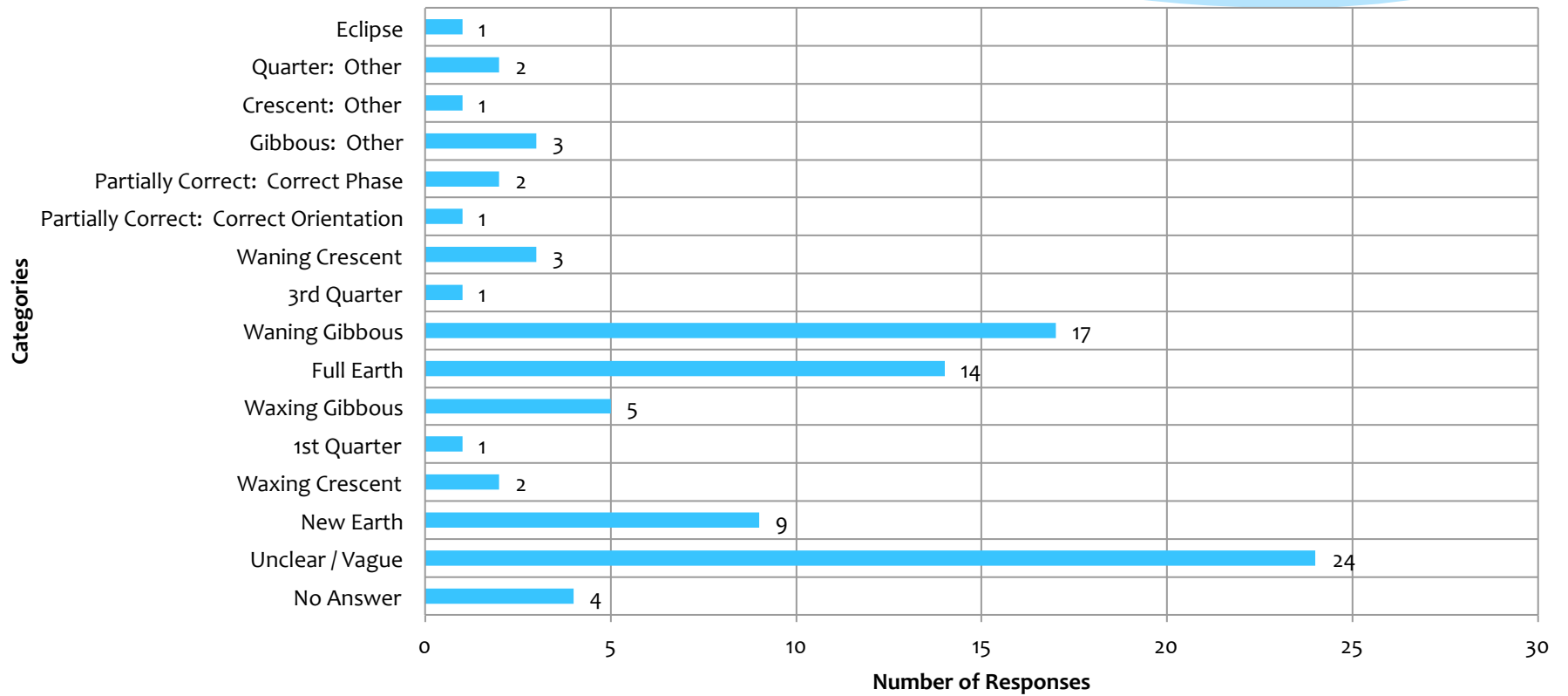
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http://www.backyard-astro.com/blog/index.php/weblog/comments/2006_02_201/

Data

Distribution of Participant Responses (n=90)



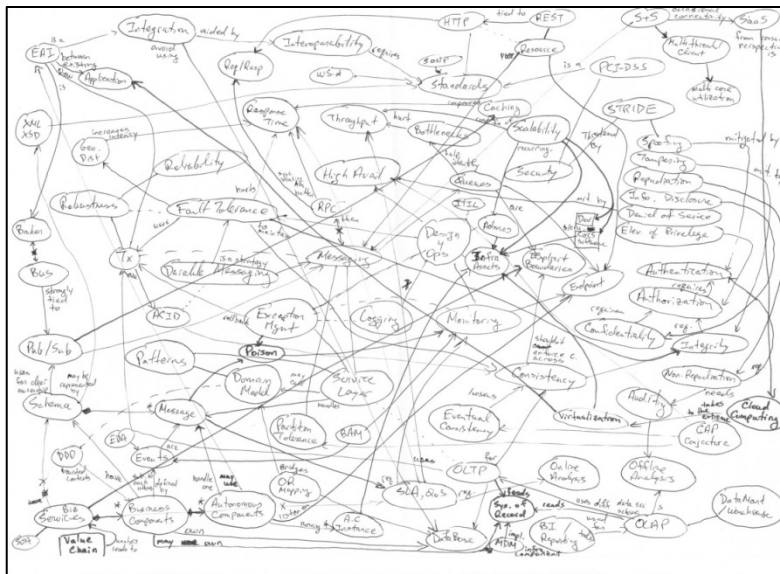
Findings

- * 2.2 % of participants answered correctly
- * 5.6 % of participants answered partially correct or better
- * Waning gibbous was the most common incorrect response (i.e., 18.9%)
- * Full Earth was the second most common incorrect response (i.e., 15.6%)
- * Conceptual interviews of samples from specific categories may reveal initial learning progressions

Next steps

Questions

References



<http://www.udidahan.com/wp-content/uploads/concept-map.jpg>

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