Grade 4-12 Student Conceptions of Astronomical Phenomena

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WHERE DISCOVERIES BEGIN

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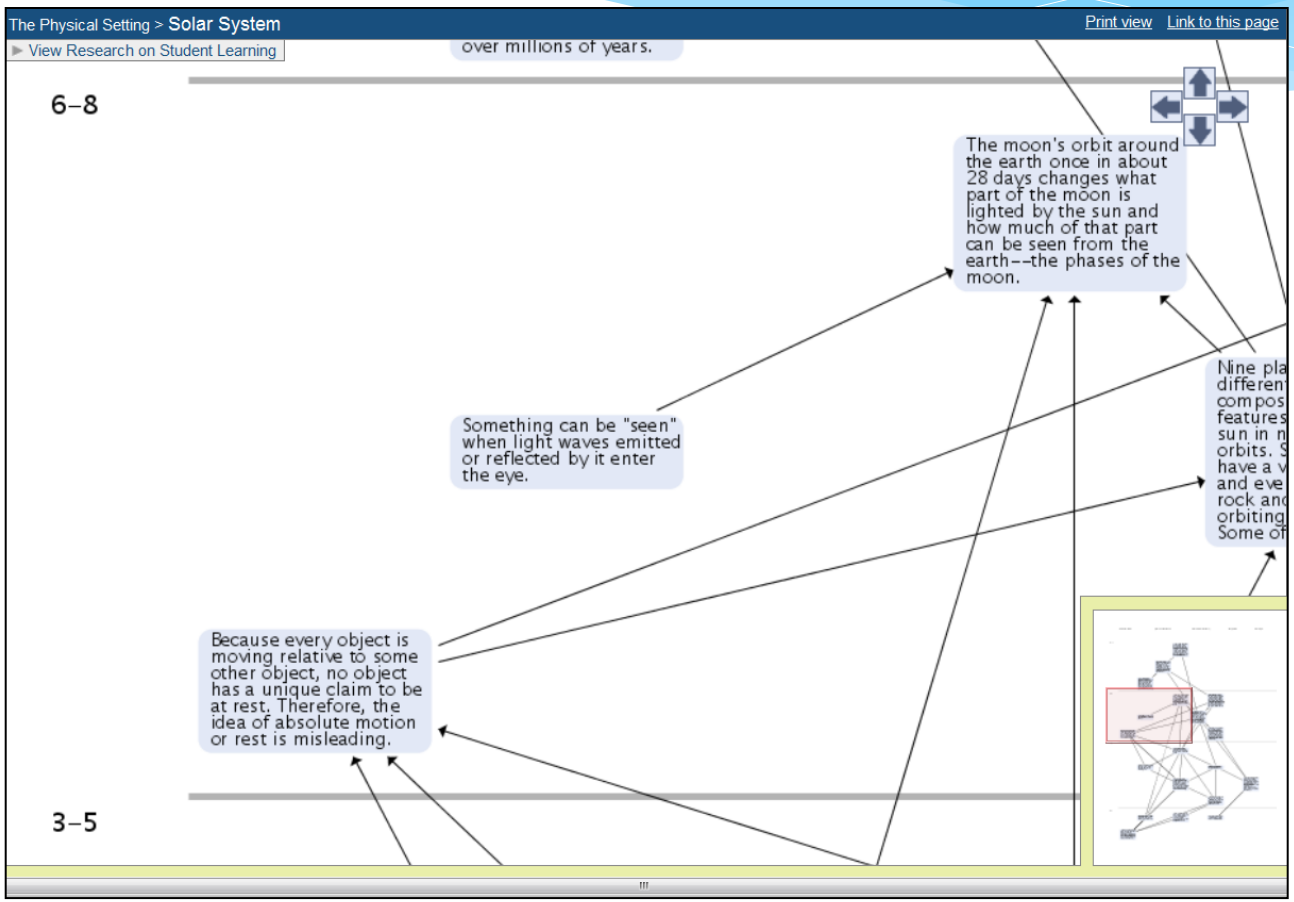
What should students know?



http://strandmaps.nsdl.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.

http://www.nap.edu/openbook.php?record_id=4962&page=160

What should students know?

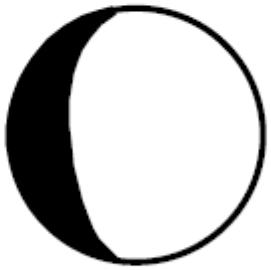
By the end of grade 5. The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily and seasonal changes in the length and direction of shadows; phases 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.

http://www.nap.edu/openbook.php?record_id=13165&page=124

How do students progress from novice to expert understanding?

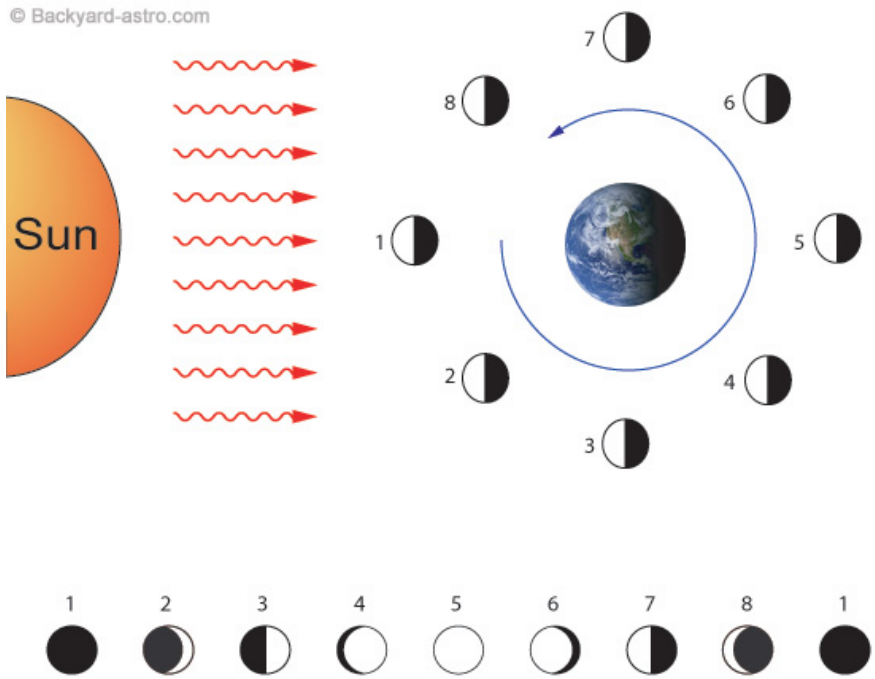
3. On a night when the right side of the Moon is mostly illuminated as seen from Earth (see picture below), how would the Earth appear in the sky to an astronaut standing on the lit side of the Moon?



Moon

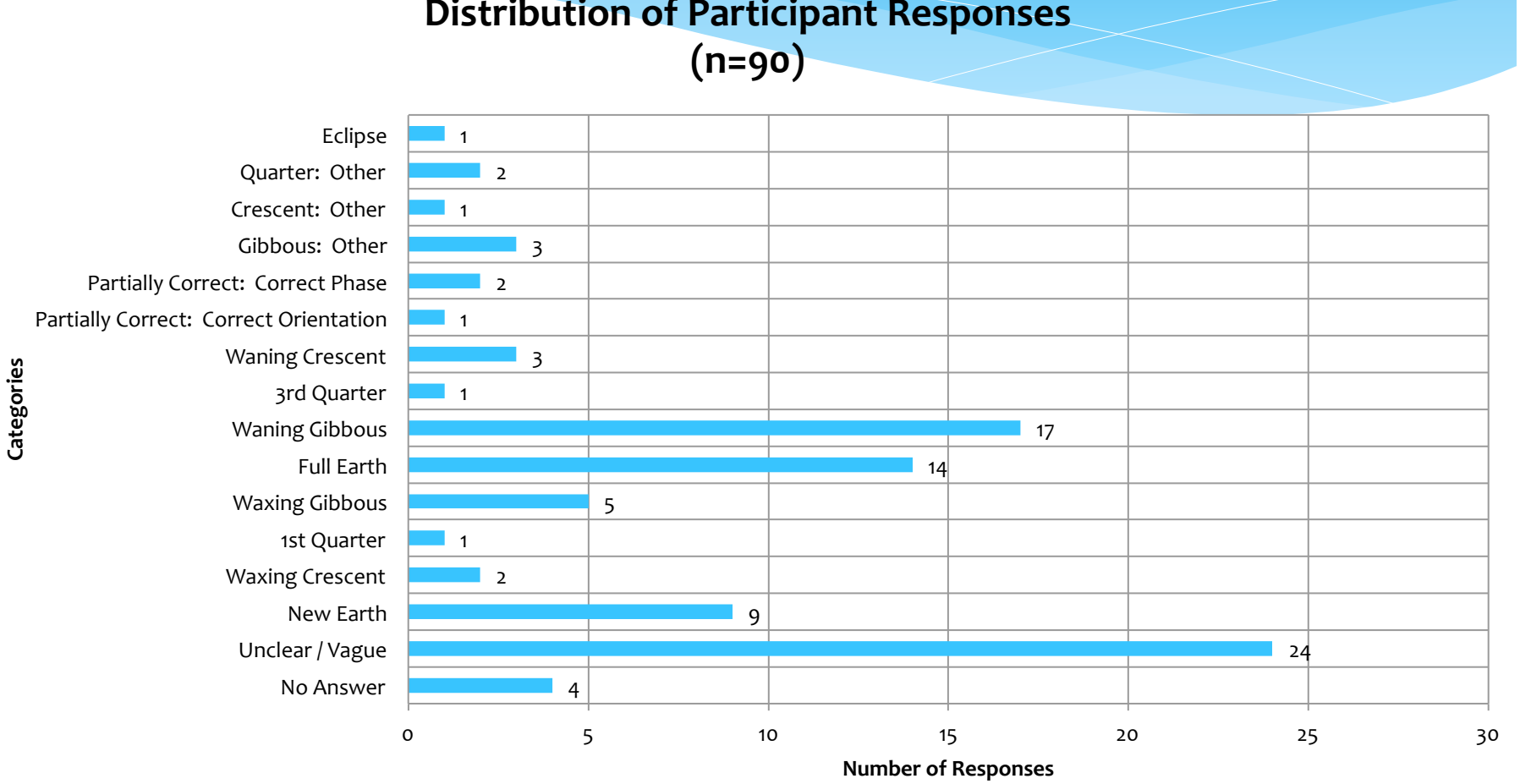
Phenomena	Diurnal Motion	Lunar Phases	Seasons	Season Change in Stars	Planetary
Cross-Cutting Themes	Pattern	Scale	Time	Motion	Position & Relations

Experts Definition



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

Data

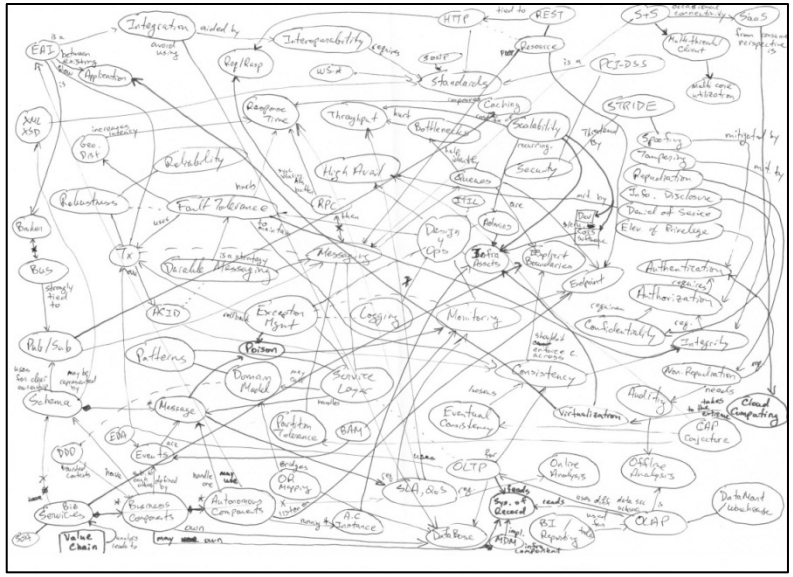

Distribution of Participant Responses
(n=90)
Categories
Eclipse
Quarter: Other
Crescent: Other
Gibbous: Other
Partially Correct: Correct Phase
Partially Correct: Correct Orientation
Waning Crescent
3rd Quarter
Waning Gibbous
Full Earth
Waxing Gibbous
1st Quarter
Waxing Crescent
New Earth
Unclear / Vague
No Answer
1
2
1
3
2
1
3
1
17
14
5
1
2
9
24
4
0
5
10
15
20
25
30
Number of Responses

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



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

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