

Phases of the Moon

Critical teaching ideas - Science Continuum F to 10

Level: Moving towards level 4

Student everyday experiences

Children interpret the world from their own point of reference as an observer on the surface of the Earth. (See Day and Night). This has consequences for their understandings of ideas that include objects on a very large and often unimaginable scale like the sun, earth and moon system. Their ideas about observations of the moon are often creative and unique. Some more general views are expressed here.

Students hold a range of views used to explain the illumination of the moon:

- We can only see the moon at night.
- The moon absorbs the sun's light and then emits it.
- The moon makes light.
- The moon shines because it is bright compared to the darkness that surrounds it.

Many students believe that phases of the moon are caused by:

- the earth's shadow or,
- clouds covering part of the moon or,
- the amount of light reflected off the earth onto the moon.

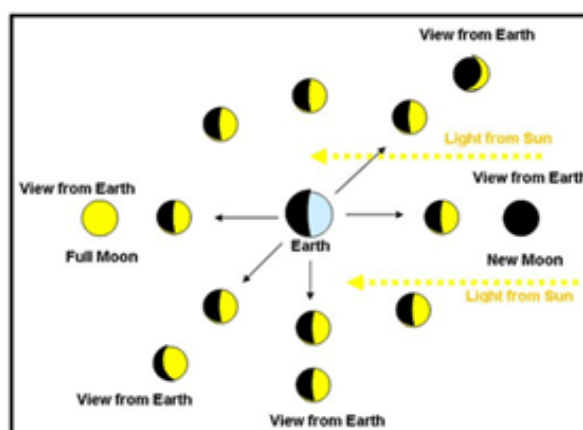
(See Skamp, 2004).

The scientific view

The earth is one of several planets that orbit the sun, and the moon orbits around the earth. The earth is essentially a sphere and the sun is a nearby star which is an unimaginably large ball of gas that radiates light and heat as products of nuclear reactions.

The moon orbits the earth once every 28 days while the earth orbits the sun once every 365 days.

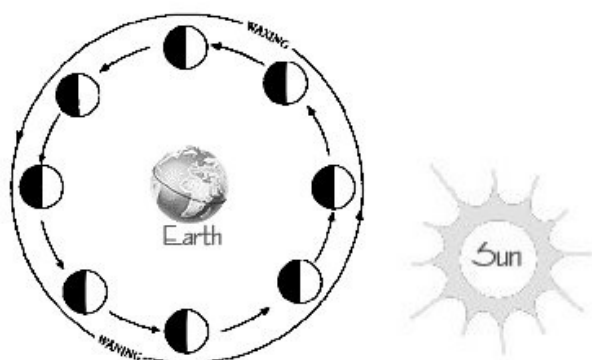
(See Day and Night).



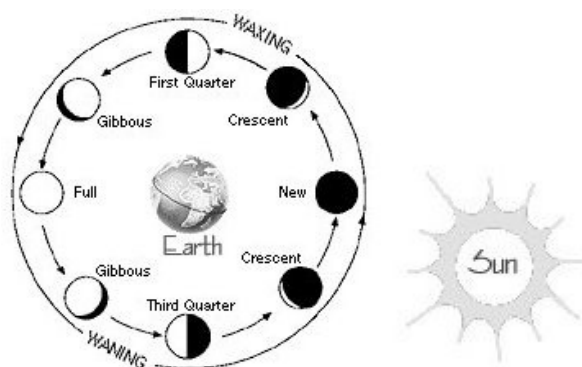
The sun always illuminates half of the moon and we can see the moon because the light produced by the sun is reflected from the moon's surface. The illuminated shape of the moon that we see from the earth appears to change continuously as the moon revolves around the earth during its 28 day journey. This apparent change in the moon's shape is a consequence of us seeing changing amounts of the illuminated surface. The moon is mistakenly thought to be only visible at night but can be seen in the day time sky with some difficulty.

<http://home.hiwaay.net/~krcool/Astro/moon/moonphase/>

The earth moon system viewed from above our solar system



The view of the moon as seen from the earth



Images adapted from <http://starchild.gsfc.nasa.gov/docs/StarChild/questions/question3.html>

Critical teaching ideas

- The earth and the moon are spheres and the sun is a star and produces light.
- The earth, moon and sun are part of the solar system, with the sun at its centre.
- The sun is so close compared with other stars that it is the major source of almost all of the light we observe in the day as well as the light reflected by the moon.
- The moon is visible because it reflects light from the sun which always illuminates half of the moon's sphere. This can be observed sometimes in the daytime and sometimes at night.
- The moon appears to change shape each month because we see different amounts of the illuminated surface of the moon at different times each month due to the relationship between the positions of the earth, sun and moon at any particular time.

Students should be encouraged to make use of observe the moon which can be seen sometime in the daytime and sometimes at night. Students should then be guided to develop their own questions to research and explore. In this way the research is more directed and not simply a fact finding exercise.

Students' preconceptions should be identified and then their understanding should be guided and developed through discussion and hands-on activities. Opportunities to make models and to manipulation the models to help students explain their ideas should be provided. The

manipulation of models also assist students to view the motion of the sun, earth and the moon from a new perspective, as an observer of the whole system, as opposed to their usual perspective, as an observer on a very small region on the surface of the earth.

Teaching activities

Promote reflection and clarification of existing ideas.

Student drawings and the associated student explanations can be used to explore student ideas of the motion of the earth, moon and sun. Discussion can be used to challenge the existing ideas held by students and to help them to reflect on their understanding.

Students to collect evidence/data for analysis.

Students can make observations of the apparent shape of the moon and record how the moon looks throughout the month. After they have collected this data they can then explore how their observations could be explained by making a model of the sun, the earth and the moon and manipulating the model to replicate their observations. (It may be helpful to use a strong torch to model the sun.) Then they can role play the motion to demonstrate their understanding of the phases of the moon.

Students could explore indigenous interpretations of the motion of the sun, earth and moon.

In order to promote reflection of ideas students could explore the ideas of early scientists and how they are similar or different from their own ideas.

Further resources

Science related interactive learning objects can be found on the [FUSE Teacher Resources](#) page. To access the interactive learning object below, teachers must login to FUSE and search by Learning Resource ID:

- **Earth Rotation: Sky Watch** – Turn an animated model of the Earth to explore how rotation affects the view of objects in the sky. Use a camera on the Earth's surface to compare views of sunrise, sunset, the movement of the Moon and position of the stars. Compare views from space with views from the Earth. Answer a series of questions by experimenting with the model. For example, work out the time of day from given views. This learning object is one in a series of four objects.
Learning Resource ID: 68GQQZ