# *Dark side of the moon* Teaching and learning plan

## Learning intentions

Students will be able to:

* identify questions that can be investigated scientifically
* identify that the moon rotates on its axis as it moves around the Earth, and hence experiences day and night just as the Earth does
* describe the way the moon moves around the Earth and hence explain why the same side of the moon always faces the Earth as it moves around the Earth
* explain why the shape of the moon that we can observe from Earth, changes as it moves around the Earth
* analyse information from digital technologies and images to arrange the different phases of the moon in chronological order
* appreciate the importance of scientific discovery in changing people’s understanding of the world around us
* communicate their ideas using appropriate scientific language and representations.

## Suggested time for this CLE

The time needed to complete the *Dark side of the moon* CLE will depend on the depth of the prior knowledge of students, the time to perform the two investigations (‘What is the dark side of the moon?’ and ‘The moon’s changing face’) and follow up with any further extension activities. Allow 3–4 hours.

[**Planning ahead and equipment list**](http://assist.asta.edu.au/sites/assist.asta.edu.au/files/Dark%20side%20of%20the%20moon_yr%207_Planning%20and%20equipment%20list.docx)

## Safety considerations

When you and your class are completing your Risk Assessment consider the following safety points and add any other relevant ones to the list:

* Students should not shine bright lights into the eyes of other students as they study the phases of the moon.

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## Introduction

This CLE focuses on predictable recurring phenomena caused by the relative movements of the Earth, moon and sun and links to year 7 Australian Curriculum: Science. It is essential that students understand the terms ‘revolution’ and ‘rotation’ in relation to the movement of the moon around the Earth and the moon’s rotation on its axis.

### What to do

1. Brainstorm student’s current understanding of the moon. Try to elicit a sense of wonder and mystery about the Earth’s only natural satellite.

* How does the moon impact our daily lives?
* What do we really know about the moon?
* How do we manage to get information about the moon?

1. Show students the video clip of the Apollo 11 Mission to the Moon. ‘NASA Apollo 11 moon mission original footage’ You Tube (7:41 min)

<https://youtu.be/LNm1LVJTJ2k>

1. Question students to determine their understanding about why we can see the moon and clarify any misunderstanding about the source of light coming from the moon. Ensure that students understand that the reason that we can see the moon is that it is acting like a mirror and reflecting light from the sun back to the Earth.
2. Explain to the students that the following 2 activities will focus on scientific investigations of the way the moon moves in space and why its shape appears to change from day to day.
3. Initiate discussion by asking if students have heard the phrase ‘The dark side of the moon’. There could be a range of answers including references to the album by Pink Floyd. (Maybe play some of Pink Floyd’s Dark Side of the Moon in the background)
4. Discourage students from providing too much information in the form of explanations, as the goal is to encourage student curiosity as to what the dark side of the moon could be and to find out for themselves that the moon does not have a permanent dark side, but that the sun actually shines on the whole surface of the moon as it rotates on its axis.
5. Explain to students that the term ‘The dark side of the moon’ has traditionally held ominous foreboding about the moon, particularly at a time when people did not know very much about the moon.
6. Explain that the space missions which sent people to the moon have provided us with much more information about the moon and that this new information has helped to improve our understanding of the moon.

## Core

### Investigation 1 – The dark side of the moon

### Equipment needed

Per student:

* computer
* [Problem solving scaffold](http://assist.asta.edu.au/sites/assist.asta.edu.au/files/Dark%20side%20of%20the%20moon%20_yr%207_Problem%20solving%20scaffold.docx)
* [The moon worksheet](http://assist.asta.edu.au/sites/assist.asta.edu.au/files/Dark%20side%20of%20the%20moon_yr%207_%20The%20moon%20worksheet.docx)

Per group:

* large Earth globe or basketball
* small ball e.g. tennis ball, table tennis ball, golf ball
* strong light source e.g. overhead projector, lamp or large torch
* [Stimulus material](http://assist.asta.edu.au/sites/assist.asta.edu.au/files/Dark%20side%20of%20the%20moon_yr%207_%20Stimulus%20material.docx)

### What to do

1. Explain that students will be working in groups on a problem solving activity. They will be given a cartoon, which targets the mystery surrounding the dark side of the moon. They will use the stimulus to identify a problem/question to answer and will then need to conduct research on the internet to help them provide an answer for their question.
2. Provide students with the [Problem solving scaffold](http://assist.asta.edu.au/sites/assist.asta.edu.au/files/Dark%20side%20of%20the%20moon%20_yr%207_Problem%20solving%20scaffold.docx) which will help them progress through the stages of this activity and explain the steps involved in solving a problem.
3. Provide students with the [stimulus material](http://assist.asta.edu.au/sites/assist.asta.edu.au/files/Dark%20side%20of%20the%20moon_yr%207_%20Stimulus%20material.docx) to generate discussion about ‘The dark side of the moon’.
4. Students identify their own question about the dark side of the moon. Guide them through the next two planning phases (Nos. 3 and 4 on the problem solving scaffold) of their investigation before they begin their research.
5. Students use the balls and light (which represents the sun) to help them visualise concepts that they may encounter in their investigation.
6. Once students have completed their problem solving activity they should have learnt enough to provide a brief explanation as to why there is no dark side of the moon.
7. Students should be able to answer the questions on [The moon worksheet](http://assist.asta.edu.au/sites/assist.asta.edu.au/files/Dark%20side%20of%20the%20moon_yr%207_%20The%20moon%20worksheet.docx) at the completion of this activity.

### Expected results and explanations

Students may appear to choose questions that will not produce the required information, however, they should be allowed a degree of autonomy as their question could eventually lead them to the desired answer anyway.

Students should discover that the fear and suspicion about the dark side of the moon arose because people did not understand the motion of the moon and they thought that there was one side of the moon on which the sun never shone.

Students should also discover that the moon does turn on its axis in the same way as the Earth rotates on its axis. They should also discover that the same side of the moon always faces the Earth and so we can never actually see the other side of the moon from the Earth.

Students should be able to explain that the reason we always see the same side of the moon is because the moon rotates on its axis as it moves around the Earth at exactly the right speed for it to complete one rotation as it does to make one complete revolution around the Earth.

### Investigation 2 – The moon’s changing face

### Equipment needed

Per student:

* computer
* [Phases of the moon worksheet](http://assist.asta.edu.au/sites/assist.asta.edu.au/files/Dark%20side%20of%20the%20moon_yr%207_%20Phases%20of%20the%20moon%20worksheet.docx)

Per group:

* large Earth globe or basketball
* small ball e.g. tennis ball
* strong light source e.g. overhead projector, lamp or large torch
* swivel seat (optional)

### What to do

1. Review findings from investigation 1. Elicit from students that the moon takes 27 days to move around the Earth.
2. Question students about their observations of the moon.
3. Lead the students in a discussion to identify and to describe the observable differences in the shape of the moon over a period of time. Explain that during this next activity students will be investigating why we see the different shapes of the moon as it moves around the Earth.
4. Show the students the interactive ‘Lunar Phases Interactive’ McGraw-Hill Education website <http://highered.mheducation.com/olcweb/cgi/pluginpop.cgi?it=swf::800::600::/sites/dl/free/0072482621/78778/Lunar_Nav.swf::Lunar+Phases+Interactive> to help them draw parallels between the movement of the moon through the sky, with the models used by scientists to explain the moon’s movement around the Earth.
5. Encourage students to use the balls and light sources to model the movement of the moon around the Earth and to examine the illuminated and dark side of the moon and to observe the differences in the shape of the lit surface of the balls as they move balls around each other.
6. Once students have finished their modelling activity, demonstrate the model and explain to students that it is the relative position of the Sun, Earth and the moon, which produces the different observable shapes of the moon during its revolution about the Earth.
7. Provide students with the [Phases of the moon worksheet](http://assist.asta.edu.au/sites/assist.asta.edu.au/files/Dark%20side%20of%20the%20moon_yr%207_%20Phases%20of%20the%20moon%20worksheet.docx) to complete.

## Conclusion

Once students have completed the worksheet show students a calendar page with the different phases of the moon drawn as pictures and ask students to trace the relative position of the Sun, Earth and moon for the month using their light and balls model. Sample calendar page available:

<http://www.saburchill.com/HOS/astronomy/images/081005001.jpg>

### Expected results and explanations

Students should be able to recognise the phases of the moon as they simulate the Earth-sun-moon interactions and explain why the appearance of the moon changes shape. They should also be able to identify the correct position of the moon calendar by identifying patterns in the changing shape of the appearance of the moon. Students should be able to arrange phase pictures in chronological order.

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### Additional lessons and activities about the Moon’s movement around the Earth:

* Students can investigate tides and eclipses as they also relate to the movement of the moon around the Earth and the positions of these relative to the sun.

### Assessment opportunities

Investigation 2 provides an opportunity to assess student understanding of the concepts related to predictable phenomena on Earth that are caused by the relative positions of the sun, Earth and the moon.

In addition, the level of student achievement of the Science Inquiry Skill (ACSIS130) –*Summarise data, from students’ own investigations and secondary sources, and use scientific understanding to identify relationships and draw conclusions* could be assessed.