Year 7

Conceptual narrative Science: Earth in space

In the Earth and space sciences sub-strand, there are two main conceptual threads being developed from Foundation through to Year 10, Earth in space and the Earth's surface.

Big ideas

The relative positions of the Earth, sun and moon affect phenomena on Earth.

What concepts do I want my students to understand?

- Seasons and eclipses are caused by the relative positions of the sun, Earth and the moon.
- Seasonal variation in sun angle, shadow length, day length, etc.
- The orbits of Earth and the moon.
- Phases of the moon.

Appendix 1 shows how the three interwoven strands, Science Understanding, Science as a Human Endeavour and Science Inquiry Skills, work together to build the sophistication and complexity of the science concepts from Foundation to Year 10.

This conceptual narrative illustrates one of the nine science concepts from the Australian Curriculum: Science Content structure. It tells the story of the concept in isolation of the eight others. However, there are situations when it is advisable to teach both concepts (Earth in space and the Earth's surface) together, because they complement each other.

Note: Not all concepts are specifically addressed in each year level.

Introduction

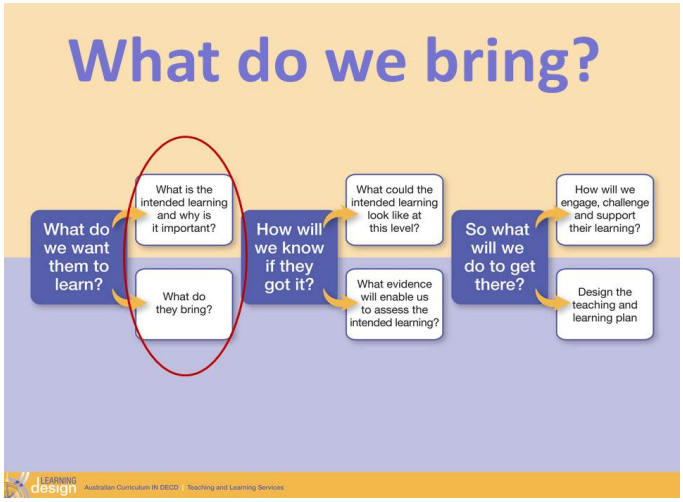
What might my students already know about this concept?

The Earth revolves around the sun as part of a system of planets called the solar system.

What content could I use to explore this concept?

Phenomena that show the relationship of the positions of the sun, Earth and moon are lunar and solar eclipses, seasons and phases of the moon. We could observe images and data of winter and summer midday sun, phases of the moon and/or eclipses. We could explore a range of resources such as day/night maps of the world, digital learning objects, commercial posters and 3D models, a torch and a world globe on a tilted axis.

Now to bring the essence of scientific understanding to life, let's think about this concept through the six questions from the Bringing it to Life tool (BitL).



At Year 7, students learn about the phenomena caused by the positions of the moon, sun and Earth. Phenomena include eclipses and the more challenging idea of explaining seasons by considering the combination of the tilt of the Earth's axis, as well as its rotation on that axis and revolution around the sun.

Year 7 example

In this example, I would ask my students to investigate the cause of the phases of the moon.

What do you observe?

How can I help my students make observations?

Using the BitL questions, I could ask:

- *What do you observe?*

At Year 7, I want my students to observe differences that change over time and geographically. I would ask my students to observe the moon over a month. I might ask them to look at the moon at the same time or different times, such as sunrise and sunset. Questions I would ask my students are:

- *What do you notice about the moon?*
- *What is changing?*
- *What stays the same?*
- *What equipment might aid your observations?*

What patterns and relationships can you see?

How can I help students to see patterns and relationships? What questions might my students ask?

Student's curiosity leads them to ask questions. These questions help students to order their findings into a pattern to be able to make comparisons or find relationships. These questions support students to be more precise and foster analysis and classification of the observations.

Using the BitL questions, I could ask:

- *What patterns and relationships can you see?*

At Year 7, I want my students to focus on the patterns. Questions I could ask are:

- *What is happening here?*
- *What patterns do you see?*
- *If there is a pattern, how long before it repeats itself?*
- *How does this relate to phases of the moon?*

What do you predict will happen?

How can I help students to identify and formulate investigable questions?

Students ask testable questions that help them to narrow the focus of the inquiry. These questions provide opportunities for students to make predictions.

Using the BitL questions, I could ask:

- *What do you predict will happen?*

At Year 7, I want my students to make predictions based on scientific knowledge. I could ask my students:

- *What if we moved ahead in time?*
- *How would the position of the Earth, sun and moon change?*
- *When do you predict the next full moon will be?*
- *How has thinking changed about the Earth, sun and moon over time?*
- *What if we used this light to represent the sun and a golf ball to represent the moon? How could this help you explain and predict the moon's change in shape and position?*

What investigations could you design?

These questions support students to develop science inquiry skills and problem solve.

Using the BitL questions, I could ask:

- *How can you test it?*

I could ask my students:

- *How might you test your predictions?*
- *Are there digital technologies, for example cameras, sound recorders, which might aid you in designing and recording your investigation?*
- *What could you use to represent the sun, Earth and the moon? How would you move them?*
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How can you review and communicate?

How can I help students share their observations and questions?

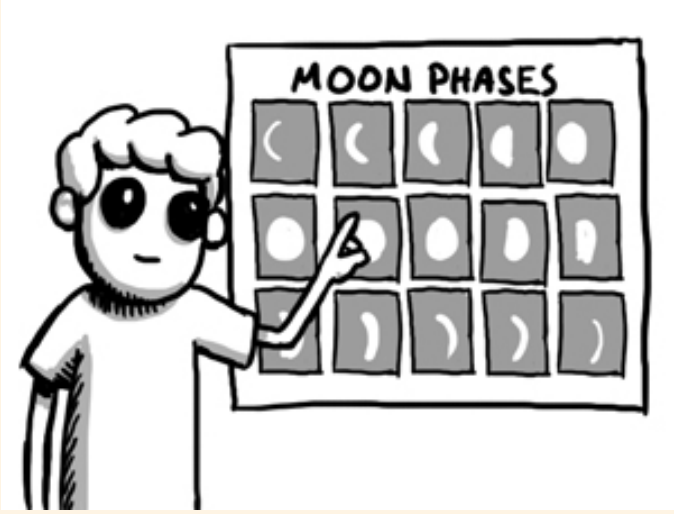
These questions stimulate student's reasoning and help them analyse, draw conclusions and make generalisations about the concepts.

Using the BitL questions, I could ask:

- *How can you review and communicate?*

At Year 7, I want my students to use scientific language when they communicate their findings. Questions I could ask my students are:

- *What scientific language will you need to include to explain changes we see in the sun and moon? What tools, lists, tables, graphs or drawings might help you to share this information and help you identify the trends?*
- *How fair was your test?*
- *How could it be improved?*
- *Who might interested in the new data?*
- *What evidence was behind the thinking of the Earth, sun and moon?*



So what? What next?

How can I help students apply the concepts in a range of authentic contexts?

These questions support student's reasoning, to expand or change their ideas from their experience and evidence and generalise to new contexts.

Using the BitL questions, I could ask:

- *So what? What next?*

In Year 7, I want students to be able to respond to Earth in space issues from a scientifically informed position. I could ask:

- *Why don't we need lights for cricket practice but we do need them for netball practice when they are both on from 6-8 pm?*
- *How does an understanding of the moon's phases influence our decisions?*
- *How do they decide when Easter is?*
- *How does understanding the phases of the moon inform our understanding of how the Earth and moon move in space?*

Concluding comments

What concepts might students develop through working with the BitL questions in this way?

By exploring this science understanding through these questions, we can help our students to be able to think, work and process scientifically. Students can connect science to their world and consider why they need to learn that movement of the Earth and moon can be observed via phases of the moon.

Appendix 1

Appendix 1 shows how the three interwoven strands, Science Understanding, Science as a Human Endeavour and Science Inquiry Skills, work together to build the sophistication and complexity of the science concepts from Foundation to Year 10.

This conceptual narrative illustrates one of the nine science concepts from the Australian Curriculum: Science Content structure. These concepts develop in depth and breadth of understanding from Foundation to Year 10. This conceptual narrative tells the story of the concept in isolation of the eight others. However, there are situations when it is advisable to teach both concepts (Earth in space and the Earth's surface) together, because they complement each other.

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Earth and space sciences

In the Earth and space sciences sub-strand, there are two main conceptual threads being developed from Foundation through to Year 10. They are the concepts Earth in space and the Earth's surface. Let's look at the concept Earth in space.

Let's look at the Earth in space concept

Year 1

In Year 1, students notice observable changes in the sky. For example, students can see stars at night time.

Year 3

Year 3, students are introduced to the concept of the Earth as a body in space, where Earth's rotation on its axis is used to explain day and night.

Year 5

In Year 5, students build on their understanding of Earth as a body in space and see it is part of the solar system, which includes other planets also revolving around our star, the sun.

Year 7

At Year 7, we want students to understand that phenomena such as seasons and eclipses can be explained by how the moon moves around the Earth, and the Earth, on a titled axis, moves around the sun.

Year 10

In Year 10, students extend their perspective of the universe to include galaxies, stars and other solar systems, and can explain the origin of the universe using the Big Bang theory.

So, from Year 1 to Year 10, students develop their concept of Earth in space by using models and theories to explain their observations.