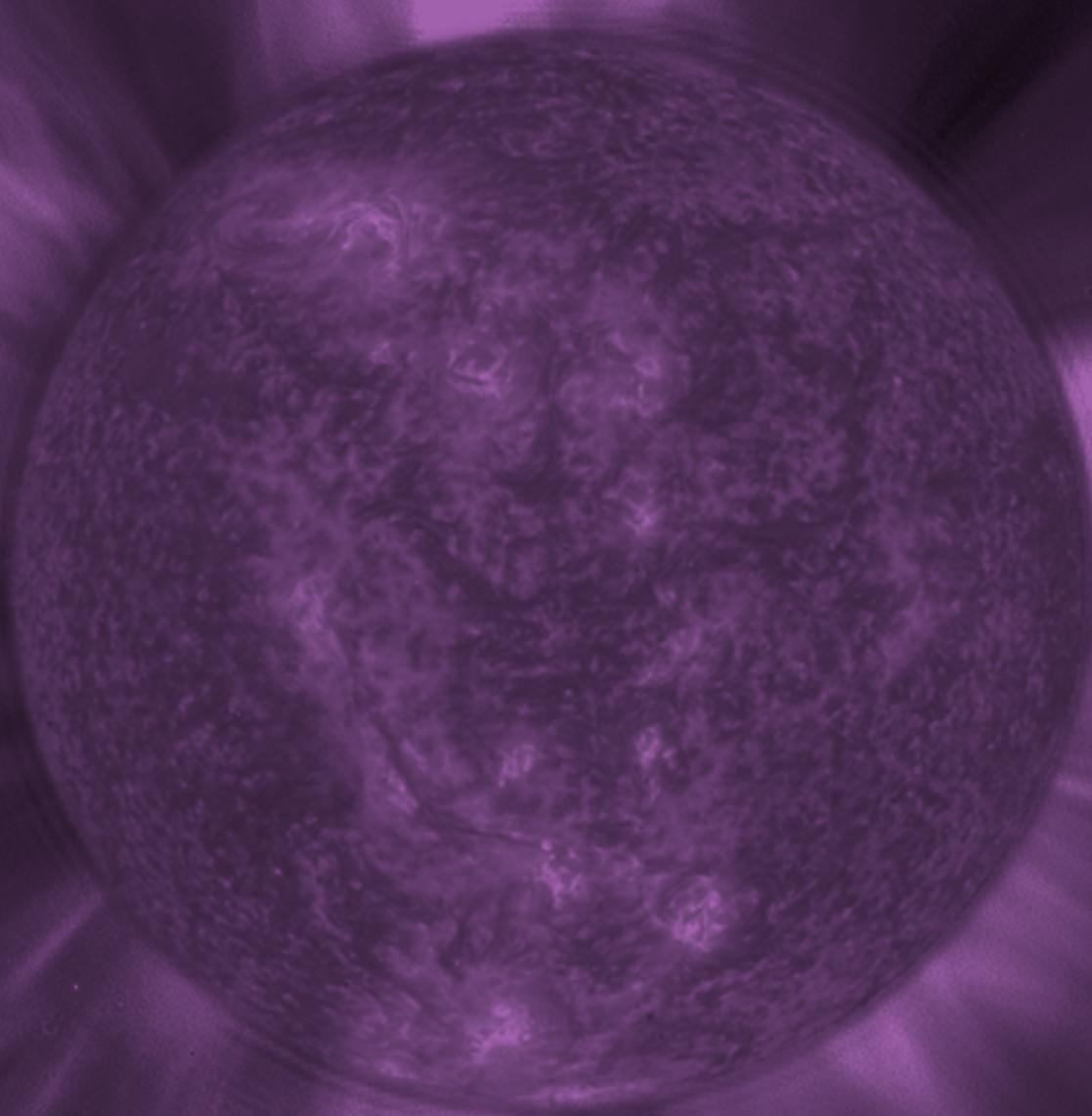




# Solar Siblings



## Curriculum Map

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*Year 10 Australian National Curriculum  
including Victoria and New South Wales*

## OVERVIEW

This document provides an explanation of how each Project within Our Solar Siblings (OSS) maps to statements that are present in the Year 10 - Earth and Space Science content strand of the Australian Curriculum (including Victoria and New South Wales)

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## SCIENCE UNDERSTANDING

The core Year 10 content strand for Earth and Space Sciences in Australia is:

***The universe contains features including galaxies, stars and solar systems, and the Big Bang theory can be used to explain the origin of the universe (ACSSU188)***

### ***Elaborations***

*identifying the evidence supporting the Big Bang theory, such as Edwin Hubble's observations and the detection of microwave radiation*

*recognising that the age of the universe can be derived using knowledge of the Big Bang theory*

*describing how the evolution of the universe, including the formation of galaxies and stars, has continued since the Big Bang*

The content statement really is in two parts:

CONTENT STATEMENT	OSS MAP
The universe contains features including galaxies, stars and solar systems.	Covered explicitly by Project 1 - Class 2 Project 2 - Class 4
the Big Bang theory can be used to explain the origin of the universe	Covered explicitly by Project 2 - Class 5 Project 2 - Class 6

## SCIENCE INQUIRY SKILLS

Many of the inquiry skills required by the Australian Curriculum are covered in particular by:

- Project 2, Class 5
- throughout the curriculum materials
- Project 3, which focusses on stars and stellar evolution, covers all of these inquiry skills in great depth.

CONTENT STATEMENT	OSS MAP
<p><b>Questioning and predicting</b>  <i>Formulate questions or hypotheses that can be investigated scientifically (AC SIS198)</i></p>	<p><b>Project 2 - Class 4</b>            Making hypotheses about the nature of galaxies and the Hubble tuning fork</p> <p><b>Project 2 - Class 5</b>            Making hypothesis about Hubble's Law and the age of the universe</p>
<p><b>Planning and conducting</b>  <i>Plan, select and use appropriate investigation types, including field work and laboratory experimentation, to collect reliable data; assess risk and address ethical issues associated with these methods (AC SIS199)</i></p> <p><i>Select and use appropriate equipment, including digital technologies, to collect and record data systematically and accurately (AC SIS200)</i></p>	<p><b>Project 1 - Class 3</b>            Using Stellarium to plan for observations, this covers the elaboration "using modelling and simulations, including using digital technology, to investigate situations and events"</p> <p><b>Project 1 - Class 1</b>  <b>Project 1 - Class 3</b>            Using the robotic telescopes to collect images</p> <p><b>Project 2 - Class 5</b>            Using a variety of software to collect and record data systematically and accurately</p>
<p><b>Processing and analysing data and information</b>  <i>Analyse patterns and trends in data, including describing relationships between variables and identifying inconsistencies (AC SIS203)</i></p> <p><i>Use knowledge of scientific concepts to draw conclusions that are consistent with evidence (AC SIS204)</i></p>	<p><b>Project 1 - Class 2</b>  <b>Project 2 - Class 4</b>  <b>Project 2 - Class 5</b>  <b>Project 2 - Class 6</b></p> <p><b>Project 2 - Class 5</b>            Using Supernova/Galaxy data to measure whether the universe is expanding or not and also to estimate the age of the universe</p>

CONTENT STATEMENT	OSS MAP
<p><b>Evaluating</b>  <i>Evaluate conclusions, including identifying sources of uncertainty and possible alternative explanations, and describe specific ways to improve the quality of the data (AC SIS205)</i></p> <p><i>Critically analyse the validity of information in primary and secondary sources, and evaluate the approaches used to solve problems (AC SIS206)</i></p>	<p><b>Project 2 - Class 5</b>  Exploring the fit of the data to Hubble's Law</p> <p>This statement is not addressed in OSS, although partially by the "Science as a Human Endeavour" activity.</p>
<p><b>Communicating</b>  <i>Communicate scientific ideas and information for a particular purpose, including constructing evidence-based arguments and using appropriate scientific language, conventions and representations (AC SIS208)</i></p>	<p><b>Project 1 - Class 2</b>  Presentation of their research on different types of objects</p> <p><b>Project 2 - Class 3</b>  Checking and Comparing Images</p> <p><b>Project 2 - Class 4</b>  Creating and presenting Galaxy Colour Images</p> <p><b>Project 2 - Class 6</b>  Presentation on part of the large-scale structure of the universe</p>

## SCIENCE AS A HUMAN ENDEAVOUR

There are four statements in "Science as a Human Endeavour" for Year 10

***Scientific understanding, including models and theories, is contestable and is refined over time through a process of review by the scientific community (ACSHE191)***

***Advances in scientific understanding often rely on technological advances and are often linked to scientific discoveries (ACSHE192)***

***People use scientific knowledge to evaluate whether they accept claims, explanations or predictions, and advances in science can affect people's lives, including generating new career opportunities (ACSHE194)***

***Values and needs of contemporary society can influence the focus of scientific research (ACSHE230)***

We provide a student research activity in **Project 1, Class 1** to address these statements. There is more detail provided there, but this activity covers the first two statements. It also covers part of the elaboration of the third statement. We suggest that the fourth statement may be addressed more clearly in the evolution or climate change issues also within the content of the Year 10 curriculum.

## AN EXAMPLE FIRST TIME THROUGH OSS

If you were wanting to just try out part of the approach in a no-stress environment... perhaps in a science club, in any number of “free-time” type periods or in the period after exams, the following is a minimalist approach. The broad body of the students find the colour imaging part the most engaging typically and this covers the ‘objects of the universe’ half of the Year 10 Australian Curriculum statement:

Time Allocation	OSS PROJECT DESCRIPTION
Period 1 (50 minutes)	<p><b>Project 1 - Class 2: Objects in the Universe</b> To know about some of the pretty objects</p>
Period 2 (50 minutes)	<p><b>Project 1 - Class 3: Planning an Observation Session</b> To pick an object in the night-sky to observe, make sure the student teams pick an object each before the end of the lesson!!!</p>
<p><b>Put the students’ chosen objects in to be observed by the telescopes at the LCO website (if you do not have time, you can email us the objects)</b></p>	
Period 3 & 4 (50 minutes + 50 minutes)	<p><b>Project 2 - Class 2: Constructing a colour image</b> Use the provided samples to practice</p>
Period 5 (50 minutes)	<p><b>Project 2 - Class 2: Constructing a colour image</b> Use their images to construct their own image from their requests. They can compare their images to other images (<b>Project 2, Class 3</b>) if desired.</p>

## A FULL IMPLEMENTATION OF PROJECT 1 AND PROJECT 2 FOR THE AUSTRALIAN CURRICULUM

Once you are comfortable with the shortened version, you might like to try adding on classes to your implementation to make it up to the full set of activities.

Time Allocation	OSS PROJECT DESCRIPTION
Period 1 (50 minutes)	<p><b>Surveys</b> BEFORE anything happens, get the students to undertake the surveys.</p> <p>Email <a href="mailto:michael@oursolarsiblings.com">michael@oursolarsiblings.com</a> and let us know.</p> <p>We can provide you with a class report giving you an idea of what your students know and do not know already</p>
Period 2 (50 minutes)	<p><b>Project 1 - Class 1</b> In this class, introduce the topic of astronomy and telescopes in general using the material provided. If you are running the "Science as a Human Endeavour" component, allocate the topics to the individuals or groups and let them know the date for the presentation.</p> <p>If you are undertaking the "Initial thoughts on the universe" activity, do the initial worksheet in this class. There is a lot of 'small stuff' in this class, so if time is running out, it is best to drop the introductory powerpoint to save time as it isn't entirely necessary.</p> <p>The telescope worksheet is also optional.</p>
Period 3 (50 minutes)	<p><b>Project 1 - Class 2: Objects in the Universe</b> To know about some of the pretty objects</p>
Period 4 (50 minutes)	<p><b>Project 1 - Class 3: Planning an Observation Session</b> To pick an object in the night-sky to observe, make sure the student teams pick an object each before the end of the lesson!!!</p>
<p>Put the students' chosen objects in to be observed by the telescopes at the LCO website (if you do not have time, you can email us the objects)</p>	
Period 5 (50 minutes)	<p><b>Project 2 - Class 1: Introduction to Colour Imaging</b> You can generally start on Class 2 during this period also</p>

Time Allocation	OSS PROJECT DESCRIPTION
Period 6 & 7 (50 minutes + 50 minutes)	<p><b>Project 2 - Class 2: Constructing a colour image</b>            First with the provided trial images</p>
Period 8 (50 minutes)	<p><b>Project 2 - Class 3</b>            Checking and Comparing Colour Images and creating their own image.</p>
Period 9 & 10 (50 minutes + 50 minutes)	<p><b>Project 2 - Class 4</b>            Making Galaxy Colour Images and a Hubble tuning fork</p>
Period 11 - 13 (50 minutes + 50 minutes + 50 minutes)	<p><b>Project 2 - Class 5: Supernova, Big Bang and the Age of the Universe</b>            This is an especially long activity, but covers the second half of the Year 10 content statement and much of the inquiry skills curriculum</p>
Period 14 & 15 (50 minutes + 50 minutes)	<p><b>Project 2 - Class 6: Dark Matter and the Universe</b>            While the curriculum statement does not specifically state dark matter and dark energy, it is a necessary component for a full picture of the big bang and especially cosmology. This can be made shorter by only doing the second half of the class exploring where galaxies and dark matter are distributed throughout the universe</p>
Period 16 & 17 (50 minutes + 50 minutes)	<p><b>Surveys &amp; Presentations</b>            Depending on which components of OSS you chose to undertake, these classes should undertake the surveys once again (email us to send you the report for formative and/or summative assessment). The presentations for the "Science as a Human Endeavour" should take place. The personal reflections on their initial thoughts about the universe should also be completed.</p>