



## OVERVIEW

This unit focuses on developing students' knowledge of the evolution of the universe. Students work collaboratively to design, construct and install a 3-D model and soundscape that explains sights and sounds involved in the evolution process of a part of the Universe. They demonstrate their model/diorama to an audience of younger students and assist these students to use the model.

## DESIGN CONNECTIONS

- Design process
- Design in ICT

## SUMMARY OF STUDENT TASKS

Students:

- investigate the evolution of one part of the universe; for example, formation of the solar system, the life of a star
- create a model or diorama and accompanying soundscape that explains the evolution process they have explored
- plan a presentation to a group of younger students; for example, Grade 5 or 6, where they demonstrate the model and soundscape.

## LINKS TO THE ESSENTIAL LEARNING STANDARDS

This unit provides opportunities for students to develop and/or demonstrate the following knowledge and skills identified in the relevant standards statements for Level 6.

STRAND	DOMAIN	DIMENSION	KEY ELEMENTS OF STANDARDS
Physical, Personal and Social Learning	Interpersonal Development	Working in teams	'... work collaboratively, negotiate roles and delegate tasks to complete complex tasks in teams.'
	Personal Learning	Managing personal learning	'Working with the strengths of a team they achieve agreed goals within set time frames.' '... allocate appropriate time and resources to manage competing priorities and complete tasks within set time frames.'
Discipline-based Learning	Science	Science knowledge and understanding	'... apply concepts of geological time to elaborate their explanations of both natural selection and evolution, and the origin and evolution of the Universe.'
	The Arts	Creating and making	'... apply decision making skills to find the most effective way to implement ideas, design, create and make arts works.'
			'... vary the content, structure and form of their arts works to

Interdisciplinary Learning	Communication	Presenting	<p>suit a range of purposes, contexts, audiences ... and demonstrate technical competence in the use of skills, techniques and processes.'</p> <p>'... effectively use a range of traditional and contemporary media, materials, equipment and technologies.'</p> <p>'... demonstrate their understanding of the relationship between form, content and mode.'</p> <p>'... select suitable resources and technologies to effectively communicate.'</p> <p>'... use subject-specific language and conventions in accordance with the purpose of their presentation to communicate complex information.'</p>
	Design, Creativity and Technology (DCT)	Investigating and designing	<p>'... identify considerations and constraints within a design brief.'</p> <p>'They undertake research relevant to the design brief.'</p> <p>'They locate and use relevant information to help their design thinking and identify the needs of a variety of client/user groups.'</p> <p>'When designing, they generate a range of alternative possibilities, use appropriate technical language, and justify their preferred option, explaining how it provides a solution to the problem, need or opportunity.'</p> <p>'They make critical decisions on materials/ingredients, systems components and techniques based on their understanding of the properties and characteristics of materials/ingredients and/or of the relationship between inputs, processes and outputs.'</p> <p>'... take account of function and performance, energy</p>

			requirements, aesthetics, costs, and ethical and legal considerations that address the requirements of design briefs.'
		Producing	'... identify a range of criteria for evaluating their products and/or technological systems.'
		Analysing and evaluating	'... make products/systems that meet the quality, aesthetic, functionality and performance requirements outlined in the design brief.'
	Information and Communications Technology (ICT)	ICT for creating	'... use evaluation criteria they have previously developed, and critically analyse processes, materials/ingredients, systems components and equipment used, and make appropriate suggestions for changes to these that would lead to an improved outcome.'
	Thinking Processes	Reasoning processing and inquiry	'... use ICT to devise detailed plans that sequence tasks to be done, resources needed, and timelines for completion.'
			'... annotate their plans to explain changes made during the project.'
			'... discriminate in the way they use a variety of sources.'
			'They generate questions that explore perspectives.'
			'They process and synthesise complex information and complete activities focusing on problem solving and decision making which involve a wide range and complexity of variables and solutions.'
		Creativity	'... experiment with innovative possibilities within the parameters of a task ...'

## TEACHING ADVICE

### Introduction

Students work as a class, in groups of 4–5 and as individuals at different stages of this unit. Each group should investigate a different aspect of the evolution of the universe. As part of the design process students will decide on materials to use in the construction of their model and to construct the models they will need a supply of

their selected materials. The soundscape can be created using acoustic and/or digital instruments and sounds. For both these tasks, access to appropriate facilities and equipment is required.

Students should be able to complete the unit in 10–12 hours. More than one teacher may be involved in the delivery of this unit, for example, a science teacher, a technology teacher and a music teacher. Group work may be divided so that different students undertake different tasks, for example, the whole group may undertake the science components and then 2–3 students may make the model, and another 1–2 students create the soundscape.

### Prior learning

Design and Technology: some experience in working with design briefs, using a design process and safely using tools and equipment to construct a product for a particular purpose.

The Arts (Music): some experience in using selected instruments and/or sound sources to create an original composition.

### Task 1: It happened like this ...

#### Key focus

Students:

- share ideas about how the universe evolved
- research a range of possible areas for investigation
- select and research a topic.

#### Teaching and learning

This task involves students:	This task involves teachers:
<ul style="list-style-type: none"> <li>• participating in brainstorming activities</li> <li>• recording ideas</li> <li>• further discussing ideas raised in class discussion as a small group</li> <li>• investigating 3 areas of interest to the group and completing <a href="#">Worksheet 1: Facts and sources</a>. For each area, collect relevant general information from at least two sources, collate and evaluate the information collected and rank in order of preference for further investigation</li> <li>• selecting one topic for in-depth investigation</li> <li>• completing <a href="#">Worksheet 2: Key questions</a>.</li> </ul>	<ul style="list-style-type: none"> <li>• facilitating a whole class brainstorming session about the different aspects of evolution, for example: What theories do students know about?               <ul style="list-style-type: none"> <li>- big bang</li> <li>- evolution stories from non-Western cultures such as Koorie ‘dreaming’ stories</li> </ul> </li> <li>• organising groups of 4–5</li> <li>• facilitating research activities</li> <li>• recording selected topics, for example:               <ul style="list-style-type: none"> <li>- black holes</li> <li>- solar system formation</li> <li>- life cycle of a star</li> </ul> </li> <li>• facilitating research activities.</li> </ul>

### Task 2: Establishing the design brief and developing a project plan

#### Key focus

Students:

- explore ideas for ways to present research findings as a 3-D model and soundscape that will explain this aspect of the evolution of the universe to an audience of younger students
- complete a design brief

- develop a project plan.

### Design connections

The design process (Planning, Designing)

### Teaching and learning

This task involves students:	This task involves teachers:
<ul style="list-style-type: none"> <li>• discussing and documenting design possibilities for the form of the model and soundscape and choosing preferred approach. For example, sketching and annotating design ideas that draw on research gathered in Task 1. Key questions include:               <ul style="list-style-type: none"> <li>- what sort of model could be constructed and what materials may be needed? For example, diorama made from recycled materials</li> <li>- where and how will the model be installed?</li> <li>- how many components and size (actual or relative) of each? For example:                   <ul style="list-style-type: none"> <li>- how could individual planets be clustered to represent the solar system; how can relative sizes of planets and/or relative distances between planets be taken into account?</li> <li>- do the planets need to have common design elements?</li> </ul> </li> <li>- will the soundscape involve music and/or sound effects?</li> <li>- what instruments/sound sources will be used?</li> <li>- how will the soundscape be linked to the model?</li> <li>- what interactive features will the model have to assist the audience to understand the evolution of this aspect of the universe?</li> </ul> </li> <li>• completing <a href="#">Worksheet 3: Design brief pro forma</a>. Note the design brief will include reference to both the model and the soundscape. This stage will involve refining ideas and developing design options prior to selecting a preferred design that best meets the requirements of the design brief</li> </ul>	<ul style="list-style-type: none"> <li>• informing class of project timeline, for example, dates for:               <ul style="list-style-type: none"> <li>- completion of brief</li> <li>- development of model</li> <li>- development of soundscape</li> <li>- time limit for presentation to audience</li> </ul> </li> <li>• facilitating discussion of possible approaches and assisting students to respond to key questions in innovative and creative ways</li> <li>• providing information about access to resources and equipment</li> <li>• facilitating class discussion about selected design options. For example, a group investigating the evolution of a planet might consider the following questions when developing the design brief for their model:               <ul style="list-style-type: none"> <li>- what colour is the planet?</li> <li>- what chemicals/substances make up the planet?</li> <li>- what are the atmospheric conditions surrounding the planet?</li> <li>- what sounds would be heard on the planet?</li> <li>- how hot/cold does the planet get?</li> <li>- how large is the planet?</li> <li>- how far away is the planet from the sun?</li> <li>- in what direction, and how, does the planet rotate around the sun?</li> <li>- in what direction, and how, does the planet rotate around its own axis?</li> <li>- what special features does the planet have (consider moons, visible features, rings, craters, dry rivers, clouds)?</li> </ul> </li> <li>• assisting students to learn techniques and processes they will need to complete their model, for example, how they can make parts of the model move or ways of testing features of their model</li> </ul>

<ul style="list-style-type: none"> <li>determining roles, for example, establishing a 'model' team or a 'soundscape' team</li> <li>completing a project plan using <a href="#">Worksheet 4: Sequence table</a>. This includes making a list of materials that will be needed to produce the model, and preparing a timeline that identifies key stages</li> <li>sharing plans with whole class and modifying design brief in response to feedback, focusing on making the presentation as accessible and exciting as possible for the target audience</li> <li>answering questions <a href="#">Worksheet 5: Student evaluation questions</a>, Parts 1 and 2 – evaluating things you are designing, and evaluating the way you are designing (the process).</li> </ul>	<ul style="list-style-type: none"> <li>advising students about expected format of responses to questions on <a href="#">Worksheet 3: Design brief pro forma</a>, and level of detail that should be provided in the design brief and sequence table</li> <li>approving completed design briefs and sequence tables</li> <li>working with students to obtain required materials.</li> </ul>
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### Task 3: Producing the model

Note: depending on allocation of roles only some students in each group may complete this task.

#### Key focus

Students:

- construct model using design brief and sequence table as guidelines
- share work in progress with whole class and respond to feedback at key stages.

#### Design connections

Design process (Producing, Evaluating)

#### Teaching and learning

<p>This task involves students:</p> <ul style="list-style-type: none"> <li>constructing the model using a range of production processes safely</li> <li>sharing work in progress with whole class</li> <li>responding to feedback by modifying the design and product and explaining why changes were made</li> <li>completing <a href="#">Worksheet 5: Student evaluation questions</a>, Part 3 – Evaluating your own progress.</li> </ul>	<p>This task involves teachers:</p> <ul style="list-style-type: none"> <li>revising safe and accurate use of tools, equipment and machines</li> <li>facilitating sessions for each group to share and receive feedback about their work in progress. Groups should demonstrate/explain how the model illustrates the scientific concept/evidence it is intended to portray.</li> </ul>
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### Task 4: Creating the soundscape

Note: depending on allocation of roles only some students in each group may complete this task.

#### Key focus

Students:

- improvise and/or compose a soundscape
- share work in progress with whole class and respond to feedback at key stages.

## Design connections

Design process (Producing, Evaluating)

### Teaching and learning

This task involves students:	This task involves teachers:
<ul style="list-style-type: none"><li>• using an improvisation/composition process to create a soundscape that meets purpose stated in design brief and is appropriate for the target audience</li><li>• sharing work in progress with whole class</li><li>• responding to feedback by modifying design and product and noting reasons for changes</li><li>• completing <a href="#">Worksheet 5: Student evaluation questions</a>, Part 3 – Evaluating your own progress.</li></ul>	<ul style="list-style-type: none"><li>• suggesting possible purposes for the soundscape, for example:<ul style="list-style-type: none"><li>- narrative, for example, a series of sound effects that represent key events in the evolution process</li><li>- illustrative, for example, a film score like music work that describes key features of the model (e.g. a soundscape illustrating a dreaming story about the origins of night and day might include contrasting sections)</li></ul></li></ul> <p>Note: Information about composition/improvisation is provided on the <a href="#">Teacher Resource: Creating the Soundscape</a>.</p>

## Task 5: Presenting the model and soundscape

### Key focus

Students:

- prepare and rehearse the presentation
- present the model and soundscape to an audience of younger students, allowing them to 'operate' the model (as appropriate) and answering their questions.

### Teaching and learning

This task involves students:	This task involves teachers:
<ul style="list-style-type: none"><li>• discussing presentation options</li><li>• using <a href="#">Worksheet 6: Audience evaluation questions</a> to devise questions for the target audience</li><li>• rehearsing selected approach</li><li>• presenting the model and soundscape to the audience and responding to their questions</li><li>• receiving evaluation comments from audience.</li></ul>	<ul style="list-style-type: none"><li>• assisting students to contact audience and organise date/time/venue for presentation</li><li>• liaising with teacher of 'target audience' to gain feedback regarding appropriateness of intended audience evaluation questions</li><li>• providing feedback during rehearsal/s.</li></ul>

## Task 6: Evaluation

### Key focus

Students:

- construct model using design brief and sequence table as guidelines
- share work in progress with whole class and respond to feedback at key stages.

## Design connections

Design process (Evaluating)

## Teaching and learning

This task involves students:	This task involves teachers:
<ul style="list-style-type: none"><li>• collating and discussing audience comments about the presentation/ model/soundscape</li><li>• completing <a href="#">Worksheet 5: Student evaluation questions</a>, Part 4 – Evaluating your finished product.</li></ul>	<ul style="list-style-type: none"><li>• providing evaluative comments to each group and/or student.</li></ul>

## Resources

### Websites

<http://www.dreamtime.net.au/creation/index.cfm>

<http://www.rivers.gov.au/model/images.htm>

<http://www.nasa.gov/index.html>

<http://science.nasa.gov/>

<http://imagine.gsfc.nasa.gov/>

<http://outreach.atnf.csiro.au/education/senior/cosmicengine/bigbang.html>

### Teacher resource

Resource 1: Creating a soundscape

### Student materials

Worksheet 1: Facts and sources

Worksheet 2: Key questions

Worksheet 3: Design brief pro forma

Worksheet 4: Sequence table

Worksheet 5: Student evaluation questions

Worksheet 6: Audience evaluation questions