Blast off

Strand	Organiser	Level						
		1	2	3	4	5	6	B6
Technology Practice	*Investigation*	■	■	■				
	Ideation	■	■	■				
	Production	■	■	■				
	Evaluation	■	■	■				
Information	*Nature*	■	■	■				
	Techniques	■	■	■				
Materials	*Nature*	■	■	■				
	Techniques	■	■	■				
Systems	*Nature*	■	■	■				
	Techniques	■	■	■				

Purpose

The activities in this module provide opportunities for students to design and make a model of a spacecraft that would hypothetically allow two astronauts to fly to the moon. They will also create a spacecraft cockpit playspace.

Overview

The following table provides an overview of the activities in this module and the way in which these are organised into introductory, developmental and culminating phases.

Introductory	Developmental	Culminating
Our place in space. Reach for the stars. Mapping the sky. Space travel. Looking at spacecraft. Compare size, shape and distance.	Systems that cater for human needs and wants. Surviving in space. Prepare for life in space. Space mission. Selecting materials. Construct a spacecraft model.	Evaluate spacecraft. Space Innovation Expo.

Core learning outcomes

This module focuses on the following core learning outcomes from the *Years 1 to 10 Technology Syllabus*:

Technology Practice

TP 1.1 Students gather knowledge, ideas and data from familiar environments and consider how they will use this information to meet design challenges.
TP 2.1 Students organise knowledge, ideas and data about how needs and wants might be met and use this information when meeting design challenges.
TP 3.1 Students examine knowledge, ideas and data from a range of sources and establish the relevance of this information when meeting design challenges.
TP 1.2 Students generate design ideas and communicate these through experimentation, play and pictures.
TP 2.2 Students generate design ideas, acknowledge the design ideas of others and communicate their design ideas using annotated drawings that identify basic design features.
TP 3.2 Students collaboratively generate design ideas and communicate these using presentations, models and technical terms.
TP 1.3 Students make products that are meaningful to them, and describe their production procedures.
TP 2.3 Students identify, sequence and follow production procedures to make products of their own design.
TP 3.3 Students cooperatively develop and follow production procedures to make products that reflect their design ideas.
TP 1.4 Students express thoughts and opinions to evaluate their own and others' design ideas and products.
TP 2.4 Students consider initial design ideas with final products and give reasons for similarities and differences.
TP 3.4 Students test and judge how effectively their own and others' processes and products meet the design challenge.

Information

INF 1.1 Students identify and describe different forms of information.
INF 2.1 Students explain the purposes of different forms of information and describe how these are used in everyday life.
INF 3.1 Students describe advantages and disadvantages of different sources and forms of information.
INF 1.2 Students use simple techniques for presenting information for their own purposes.
INF 2.2 Students use simple techniques for accessing and presenting information for themselves and others.
INF 3.2 Students select and use techniques for generating, modifying and presenting information for different purposes.

Materials

MAT 1.1 Students identify characteristics of materials and explain how materials are used in everyday products.
MAT 2.1 Students match the characteristics of materials to design requirements.
MAT 3.1 Students choose materials according to various characteristics that best suit the product and user.
MAT 1.2 Students explore equipment and techniques when joining and combining materials for meaningful purposes.
MAT 2.2 Students select and use suitable equipment and techniques for manipulating and processing materials.
MAT 3.2 Students select and use suitable equipment and techniques to combine materials accurately in order to meet design requirements.

Systems

SYS 1.1 Students identify familiar systems and describe how these are used in everyday life.
SYS 2.1 Students identify and describe the order of components in familiar systems.
SYS 3.1 Students identify and describe relationships between inputs, processes and outputs in systems.
SYS 1.2 Students sequence steps to develop simple systems to carry out familiar tasks.
SYS 2.2 Students combine components to assemble systems in order to meet their needs and the needs of others.
SYS 3.2 Students assemble and trial systems they design by considering inputs, processes and outputs.

Core content

The core learning outcomes are the focus for planning learning activities and assessment tasks. Students will engage with core content (see pp. 37–40 of the syllabus) when they are provided with opportunities to demonstrate core learning outcomes. While the content is listed in strands for organisational convenience, no one part of that content is to be viewed as discretely associated with a single strand.

The organisation of content within a strand should not be considered hierarchical. Any of the content can be addressed at any appropriate level; not all of the content need be addressed at every level. Core content should be selected to suit students' needs, interests and abilities and to take account of their prior knowledge and experiences.

The core content should be studied in a range of contexts. These could include personal and global contexts, as well as contexts of agriculture, business, communities, home and family, industry, leisure and recreation, and school.

Using this module

The activities in this module are designed to provide opportunities for students to demonstrate Levels 1, 2 or 3 core learning outcomes. These activities can also provide opportunities for students to develop and demonstrate the related learning outcomes at other levels. In order to do this, teachers will need to develop additional sets of anticipated evidence derived from the related learning outcomes at different levels. They may also need to modify aspects of the activities. Students demonstrating Level 1 Technology Practice learning outcomes may ideate as they produce. Students will need to work cooperatively to demonstrate Level 3 Technology Practice learning outcomes.

This module includes a variety of sequenced activities requiring varying amounts of time. Teachers can modify the design challenges and related activities depending on the local contexts, particular needs and prior knowledge of students and the availability of materials and resources.

Advice to teachers

Play and playspaces

This module provides opportunities for students to learn through teacher- and child-initiated play and the creation and use of playspaces. Students explore concepts related to space and space travel as they design and construct playspaces and props.

It is widely recognised that play is important to the learning process. Children maintain a strong desire to engage in dramatic play well into the primary school years. Provision of appropriate opportunities for play requires careful planning. Play opportunities need to be offered to all students, but not forced on any. While all students can benefit from independent and collaborative dramatic play, some students may have had little experience with play, and some may initially be reluctant.

Encourage and support all students to be involved in dramatic play by allowing time for play, making play a safe activity, modelling roles and involvement in play, and offering opportunities for play that will appeal to all students. Provide play contexts that will interest both girls and boys, and change these contexts as interest wanes.

Since play co-exists with other activities, students need to learn how to use their time enjoyably without disrupting others. Teachers and students can decide on rules specific to the playspace. It is important that these rules are flexible enough to make play enjoyable. Nevertheless, players must consider the needs of others sharing the classroom. At times the teacher may be required to intervene in the play. This may be in response to a request from one of the players or may be necessary to control the direction of the play or the volume of the playing group. Teacher-in-role is a possible approach for intervening. A message from ‘mission control’ could ensure that an off-task group settles. Similarly, imaginative in-role intervention that poses a question or challenge can rekindle interest or direction in play.

Creating a classroom playspace

Signs incorporating visual images and text can be used to delineate playspaces. Students can use desks, pieces of fabric and large pieces of cardboard or boxes to create settings and props for playspaces. Teachers will need to guide students as they move furniture and use equipment. Provide a variety of materials and equipment for dressing up and for creating signs, control panels and other props. These might include items for arbitrary measurement, shapes to trace around, scissors, glue and tape. If space is limited, store materials for play in boxes and bring them into the playspace when required.

Establishing a drama contract

This module provides opportunities for students to enhance and test their understandings and design ideas as they engage in drama related to space exploration and life in space. Dramatic play requires collaboration and cooperation. Where possible, students should choose their co-players.

As students work in playful and imaginative ways, they need to distinguish between the 'pretend' and the 'reality' of the classroom experience. Before beginning the unit, students should agree to work in-role. To facilitate this, it can be useful to negotiate an informal drama contract. While this is not a written contract, establishing an agreed set of rules can be useful, especially for groups that are less experienced in drama.

A drama contract may include agreements such as:

- We agree to go along with the story.
- We agree to pretend that we [and the teacher/s] will be someone else.
- We agree to listen to each other's ideas.
- We agree that all ideas are valuable.

Students need to agree to work in a drama context and to accept and react to others, including the teacher, in-role. Expectations of appropriate behaviour, and the boundaries of dramatic fantasy and reality, need to be clearly negotiated.

Within the playspace, a teacher's role is to facilitate children's play. Teachers may enhance students' play by taking on a role when they enter the playspace. At the beginning of drama sessions, discuss working in a drama context to clarify the expectations within your classroom. Establish a contract with the students to make expectations explicit. Provide students with a signal for the teacher-in-role. A nod of agreement in response to a question such as, 'When I am holding this microphone I am going to be mission control. Are you prepared to believe that?' is sufficient. It is sometimes useful to review expectations in subsequent sessions. Maintaining clear expectations assists students to sustain focus during drama sessions.

Drama conventions

Drama conventions that might complement this unit include:

- *Defining space*: The drama is located within a specific fictional place. An area of the classroom can be modified to simulate the cockpit of a spacecraft. Students might choose to create playspaces that represent locations on other planets or satellites.
- *Freeze frames*: A series of frozen actions or pictures from a situation or story that can be presented by a small group of students to the rest of the class. The watching students close their eyes while the presenting group prepares each frame. On a signal from the teacher, the watchers open their eyes and observe each frame, which is held for about five seconds. A sequence of about three frames is needed to convey the action or story. Students can use freeze frames to demonstrate flight procedures or life in space.
- *Caption making*: The class or group devises a title that encapsulates what is being presented in the freeze frames.
- *Hot-seat*: The student in-role sits in an agreed location and is interviewed or questioned by the participants in the drama. The person in the hot-seat can question and challenge the participants. Students might accept the role of an astronaut at a press conference.
- *Mantle of the expert*: Students accept roles that require expert knowledge, such as astronaut, scientist or mission control. Students may need to conduct research about the roles in order to take on the 'mantle of the expert'.
- *Writing in role*: Students write in the first person when writing in the role they have created — for example, keeping a flight log.

Resources

Students' creativity in demonstrating core learning outcomes in this module should not be limited by the range and scope of resources and equipment provided by the teacher. A variety of resources should be collected over time and should be safely stored and made available to students as required.

In this module, students will need glue, scissors, adhesive tape, paints and a range of materials such as cardboard boxes, cardboard tubes, coloured paper, fabric scraps, string, trinkets and ribbon that can be used or adapted to simulate parts of the model spacecraft or cockpit.

Ask parents/carers and local businesses to donate materials that can be used for constructing model spacecraft and making props for their cockpit playspace.

Evaluation of a unit of work

After completion of a unit (or units) of work developed from this module, teachers collect information and make judgments about:

- teaching strategies and activities planned or selected to allow students to demonstrate the core learning outcomes
- future learning opportunities for students who have not yet demonstrated the core learning outcomes and to challenge and extend those students who have already demonstrated the core learning outcomes
- the extent to which activities matched needs of particular groups of students and reflected equity considerations
- the appropriateness of time allocations for particular activities
- the appropriateness of resources used.

Information from this evaluation process can be used to plan subsequent units of work so that they build on, and support, student learning. The evaluated units of work may also be adapted prior to their reuse. For further information, refer to the 'Curriculum evaluation' section of the sourcebook guidelines.

Links

Links to other key learning areas

Activities from this module can be used as part of an integrated unit that makes links to other key learning areas. When incorporating this module into an integrated unit of work, teachers can select activities that provide opportunities for students to demonstrate learning outcomes from other key learning areas and identify anticipated evidence of students' demonstrations of these learning outcomes. It is important, however, that the integrity of the processes and concepts within key learning areas is maintained.

This module has links to strands from the following key learning areas:

- English
- Mathematics
- Science
- Studies of Society and Environment.

Contributions to the cross-curricular priorities

This module contributes to students' development of the cross-curricular priorities:

- **literacy**, as students develop and use terminology to describe space travel, spacecraft and model making
- **numeracy**, as students develop and use concepts related to space, size and measurement
- **lifeskills**, as students develop and use skills in the areas of self-management, establishing and maintaining relationships and cooperation
- **a futures perspective**, as students envisage and evaluate options for a model spacecraft.

The valued attributes of a lifelong learner

The overall learning outcomes of the Queensland Years 1 to 10 curriculum contain elements common to all key learning areas and collectively describe the valued attributes of a lifelong learner. The following points indicate how various activities in this module might contribute towards the development of these attributes.

Knowledgeable person with deep understanding

- gains knowledge and conceptual understanding about technology practice, materials, information and systems by designing and making a model spacecraft.

Complex thinker

- evaluates the suitability of materials for particular purposes based on understandings of their characteristics
- makes decisions and justifies choices when realising designs.

Active investigator

- tests the suitability of materials for specific purposes and experiments with techniques for manipulating and processing materials
- explores aesthetic and functional implications.

Responsive creator

- uses imagination, originality, intuition, enterprise and aesthetic judgment when meeting design challenges
- envisions and generates a range of potential designs.

Effective communicator

- comprehends information presented in various forms, including three-dimensional models, sketches and formal drawings, photographs, multimedia applications, diagrams, specifications, tables and graphs
- communicates design ideas in a variety of ways.

Participant in an interdependent world

- works individually and collaboratively on a variety of design challenges with confidence and initiative
- negotiates with others and resolves conflicts when working towards common goals and sharing equipment and resources.

Reflective and self-directed learner

- displays self-discipline in managing time and resources
- displays self-motivation and perseverance in seeing projects through to completion
- uses a variety of strategies to clarify and refine design ideas.

Assessment strategies

The assessment opportunities outlined are examples of how to assess students' demonstrations of the identified learning outcomes. As often as possible, negotiate assessment with students and support a variety of ways of demonstrating the learning outcomes. Reflect with students on evidence gathered when making judgments about their demonstrations of learning outcomes. Some students may require more time and/or other contexts in which to demonstrate these learning outcomes. Other modules may provide such time and/or contexts.

Suggestions for gathering information about student learning are provided in the activities section of this module. The table below provides descriptions of anticipated evidence that teachers might gather to support their judgments about students' demonstrations of learning outcomes and suggests sources of evidence. The table is neither exhaustive nor mandatory. Once sufficient evidence has been collected, judgments can be made about students' demonstrations of learning outcomes. *[The table spreads over three pages.]*

Core learning outcomes	Anticipated evidence	Sources of evidence
TP 1.1 Students gather knowledge, ideas and data from familiar environments and consider how they will use this information to meet design challenges.	Identify features of a spacecraft and ask questions to find out about space and spacecraft. Find illustrations or descriptions of spacecraft in a range of media at home, in the library or in the classroom.	Anecdotal records: • observations of students' play and contributions to class discussions Technology project folios • students' drawings and collections of pictures and photographs • annotations of drawings, pictures and photographs.
TP 2.1 Students organise knowledge, ideas and data about how needs and wants might be met and use this information when meeting design challenges.	Match features of spacecraft to their purposes. List the needs and wants of astronauts and collect pictures or descriptions of how they can be met in spacecraft.	
TP 3.1 Students examine knowledge, ideas and data from a range of sources and establish the relevance of this information when meeting design challenges.	Use the Internet and other sources to find information about different types of spacecraft and their purposes. Explain how this information influenced their spacecraft and cockpit designs.	Technology project folios: • information about spacecraft.
TP 1.2 Students generate design ideas and communicate these through experimentation, play and pictures.	Generate design ideas by collecting pictures of spacecraft designs and participate in brainstorming and discussion activities. Communicate spacecraft and cockpit designs through pictures and roleplay and by creating models and props.	Anecdotal records: • observations of students' play and contributions to class discussions • observations of students' presentations about their designs. Technology project folios: • annotated collage, drawings, paintings, plans and models of their spacecraft • floor plans of their cockpit designs • records of their contribution to group work.
TP 2.2 Students generate design ideas, acknowledge the design ideas of others and communicate their design ideas using annotated drawings that identify basic design features.	Label collage, drawings, paintings or models of their spacecraft designs with basic features. Describe and discuss basic features of their own and others' designs.	
TP 3.2 Students collaboratively generate design ideas and communicate these using presentations, models and technical terms.	Collaborate with peers to generate spacecraft and cockpit designs. Use drawings and models labelled with relevant technical terms to communicate design ideas.	

TP 1.3 Students make products that are meaningful to them, and describe their production procedures.	Set up a cockpit playspace and describe how props for the playspace were selected and/or modified. Construct model spacecraft and explain how they were made.	Anecdotal records: • observations of students' contributions to class discussions and activities. Cockpit playspace and props. Models of their spacecraft designs.
TP 2.3 Students identify, sequence and follow production procedures to make products of their own design.	Develop production procedures for creating their models and/or cockpit playspace. Follow production procedures to create the models and/or cockpit playspace.	
TP 3.3 Students cooperatively develop and follow production procedures to make products that reflect their design ideas.	Collaboratively develop production procedures for creating models and/or the cockpit playspace. Follow production procedures to create models and/or a playspace that closely resemble their designs.	Technology project folios: • annotated production procedures.
TP 1.4 Students express thoughts and opinions to evaluate their own and others' design ideas and products.	Ask and answer questions about aspects of their model spacecraft. Comment on the performance of their model spacecraft in play.	Technology project folios: • annotated designs • production procedures • peer and self-assessment. Students' presentations.
TP 2.4 Students consider initial design ideas with final products and give reasons for similarities and differences.	Suggest reasons for differences between their design ideas and their final spacecraft models.	
TP 3.4 Students test and judge how effectively their own and others' processes and products meet the design challenge.	Use roleplay to test the cockpit playspace and record their evaluations. Judge how well their models fulfil their spacecraft design.	
INF 1.1 Students identify and describe different forms of information.	Identify forms of information related to: • household systems • space (star charts and constellation maps) • spacecraft and cockpit designs.	Anecdotal records: • observations of students' participation in activities and discussions. Technology project folios: • constellation maps • examples of signs and symbols • designs for a cockpit playspace.
INF 2.1 Students explain the purposes of different forms of information and describe how these are used in everyday life.	Explain why different forms of information, such as symbols and signs, are used for particular purposes.	
INF 3.1 Students describe advantages and disadvantages of different sources and forms of information.	Discuss the advantages and disadvantages of different sources of information such as the Internet. Compare information about spacecraft presented in various forms. Describe the advantages and disadvantages of each form.	Anecdotal records: • observations of students' contributions to discussions about various forms of presenting information.
INF 1.2 Students use simple techniques for presenting information for their own purposes.	Use different forms (signs, symbols, words) to present information about the operation of cockpit equipment.	Anecdotal records: • observations of students accessing and discussing relevant information. Technology project folios: • constellation maps • design ideas. Labels, icons, signs and buttons on cockpit consoles.
INF 2.2 Students use simple techniques for accessing and presenting information for themselves and others.	Use observation and research to access information from the Internet, the library and home. Present their design ideas using a range of media.	
INF 3.2 Students select and use techniques for generating, modifying and presenting information for different purposes.	Select and use techniques to generate, modify and present information. Present information to meet the needs of target audiences.	Space Innovation Expo submissions.

MAT 1.1 Students identify characteristics of materials and explain how materials are used in everyday products.	Identify materials used to create spacecraft and cockpits. Describe the characteristics of materials used.	Anecdotal records: • observations of students building model spacecraft and creating the cockpit playspace • observations of students' contributions to class and group discussions.
MAT 2.1 Students match the characteristics of materials to design requirements.	Explain why the strength, flexibility, weight or colour of materials makes them suitable for particular design requirements.	
MAT 3.1 Students choose materials according to various characteristics that best suit the product and user.	Test the suitability of materials for design purposes. Select materials that best meet product and user requirements.	Technology project folios: • examples or descriptions of materials • results of materials tests.
MAT 1.2 Students explore equipment and techniques when joining and combining materials for meaningful purposes.	Experiment and play with a range of materials and equipment as they explore techniques for creating their models. Use props to simulate features of the cockpit.	Anecdotal records: • observations of students' participating in discussions • observations of students using equipment and techniques to create the cockpit playspace and props. Technology project folios: • lists of materials required. Spacecraft models. Cockpit playspace and props.
MAT 2.2 Students select and use suitable equipment and techniques for manipulating and processing materials.	Select and use available equipment such as hammers and scissors to manipulate materials. Use suitable techniques to manipulate materials and explain, for example, why cutting might be preferable to tearing.	
MAT 3.2 Students select and use suitable equipment and techniques to combine materials accurately in order to meet design requirements.	Use equipment and techniques with precision when measuring, cutting and joining materials to construct their spacecraft models and props for the cockpit playspace.	
SYS 1.1 Students identify familiar systems and describe how these are used in everyday life.	Explain how human needs and wants are met by household systems. Identify the systems required in the cockpit environment to meet the needs and wants of astronauts.	Anecdotal records: • observations of students' participation in activities. Technology project folios: • cockpit designs • spacecraft designs • production procedures. Cockpit control panels. Spacecraft models. Space Innovation Expo submissions.
SYS 2.1 Students identify and describe the order of components in familiar systems.	Draw or explain the components of a spacecraft and/or cockpit.	
SYS 3.1 Students identify and describe relationships between inputs, processes and outputs in systems.	Describe how spacecraft components work together to achieve their purpose. Indicate how components interact by annotating spacecraft and cockpit designs.	
SYS 1.2 Students sequence steps to develop simple systems to carry out familiar tasks.	Explain how to assemble their spacecraft models and plan and act out, for example, 'lift-off' procedures. Describe how astronauts' needs and wants are met in space.	Anecdotal records: • observations of students discussing spacecraft and assembling their models • observations of students creating the cockpit playspace and acting out 'lift-off' procedures • observations of the Expo presentations and performances. Technology project folios: • production procedures for creating model spacecraft. Expo submissions.
SYS 2.2 Students combine components to assemble systems in order to meet their needs and the needs of others.	Combine components to assemble a model spacecraft. Assemble a cockpit playspace and describe how particular props meet the needs of astronauts.	
SYS 3.2 Students assemble and trial systems they design by considering inputs, processes and outputs.	Identify and sequence components of their spacecraft models. Assemble their models and describe how the spacecraft should work by referring to inputs, processes and outputs. Assemble a cockpit playspace and trial its operation through roleplay and acting out systems procedures.	

Background information

Terminology

In this module students have opportunities to become familiar with and use the following terminology:

alarm
astronaut
buttons
cable
cockpit
console
constellations
control panel
countdown
design challenges
design ideas
dial
display panel
environments
explore, exploration
ideate
investigate
knob
launch (blast-off, lift-off, take-off)
levers
materials
models
moon buggies
NASA (National Aeronautics and Space Administration)
navigate
navigation
power source
production plans
rocket
satellite
sequence
shuttle
spacecraft
spaceship
spacesuit
steps
switch
systems
techniques
touch pad
wire

School authority policies

Teachers need to be aware of and observe school authority policies that may be relevant to this module.

Safety policies will be of particular relevance to some of the activities that follow. It is essential that teacher demonstrations and student activities are conducted according to procedures developed through appropriate risk assessments at the school.

In this module, teachers may need to consider safety issues relating to:

- cutting materials
- adhesives used in construction of models.

Equity considerations

This module provides opportunities for students to increase their understanding and appreciation of equity and diversity within a supportive environment. It includes activities that encourage students to:

- be involved
- work individually or in groups
- value diversity of ability, opinion and experience in developing design ideas
- value diversity of language and cultural beliefs
- support one another in their efforts when designing and constructing the cockpit playspace
- become empowered to communicate freely
- negotiate and accept changes to design ideas.

It is important that these equity considerations inform decision making about teaching strategies, classroom organisation and assessment.

Some students with disabilities may need assistance with some activities. Advice should be sought from their support teachers.

Activities

Introductory activities

Focus

These introductory activities provide opportunities for students to develop a sense of 'space', investigate features of the night sky and consider factors that influence the design of spacecraft. They develop and use terminology for discussing and describing spacecraft and space travel, and examine sources and forms of information about these topics.

Teaching considerations

Parents/carers can be encouraged to support their children's learning in a number of activities. Prepare an overview of the unit for parents/carers and include suggestions of ways they can support their children's learning during activities that involve investigating at home.

Resources

Children's books about the night sky, planets and space travel such as:

- *My Place in Space* by Robin and Sally Hirst
- *The Legend of the Seven Sisters: A Traditional Aboriginal Story* by Mary O'Brien
- *A Book About Planets* by Betty Reigot.

Background information for teachers can be found in:

- Aboriginal Sky Figures by Gaparingu Naputa
- Australian Dreaming: 40,000 Years of Aboriginal History edited by J. Isaacs.

Cardboard sky viewers and star charts.

Materials for recording constellation maps.

Technology project folios and chart materials for recording students' ideas.

Computers, Internet access and spreadsheet software.

Videos on spacecraft, space travel and the moon.

Activity 1

Our place in space

Technology Practice (Investigation), Information

Links to English

1. Read *My Place in Space* or a similar book. Discuss the concept of space and record students' ideas on a chart for future reference.
2. Ask students what they know and what they would like to know about space. Record this information on a chart. Develop a class word bank of terminology used to describe space and the various elements within it. Display the charts in the classroom.
3. Discuss where students are likely to find information about space. Discuss why different forms of information might be used for particular purposes — tables, diagrams and maps.

Activity 2

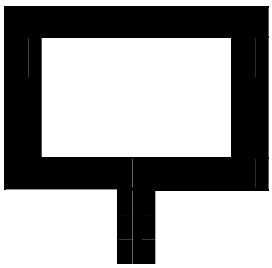
Reach for the stars

Technology Practice (Investigation)

Links to Science:

***EB 1.1** Students identify and describe obvious features of the Earth and sky (including landforms and clouds).*

1. Organise a school sleepover or arrange for parents/carers to work with their children or groups of children at home.
2. Ask students to:
   - look at the night sky
   - describe what they see
   - guess how many stars there are
   - look at a section of the sky through a sky viewer and try to count the number of stars they see
   - look at different sections of the sky and try to count the stars.



Sky viewer — a cardboard square, rectangle or circle with the middle cut out, and a handle.

3. Encourage students to discuss what they see.
   - Are any two sections of the sky the same?
   - Do different sections have the same number of stars?
   - What colour are the stars? What size are the stars?
   - Why might they be different colours and sizes?

[Introductory activities continue on next page.]

Activity 3

Mapping the sky

Technology Practice (Investigation), Information

Links to English, SOSE and Science:

***EB 2.1** Students identify and describe changes in the obvious features of the Earth and sky (including changes in the appearance of the moon).*

1. Investigate traditional beliefs about objects we see in the sky. Read and discuss traditional stories such as 'The Legend of the Seven Sisters'. Discuss Aboriginal sky figures (constellations) and their relationship to dreaming stories.
2. Ask students to look at the night sky and draw a constellation. Then ask them to go to another area of their home, the school or neighbourhood and find their constellation and see if it looks the same.
3. Explain that, in the past, sailors used the stars to guide them across the seas. Discuss how we find our way around on land. Are there any landmarks at sea?
4. Discuss the signs and symbols used to represent constellations on a star chart.
5. Make multiple copies of some of the students' constellation maps. Provide students with a constellation map. Ask students to draw lines between the stars to create pictures and then make up names for the constellations they have drawn.
6. Display the students' constellations in the classroom.

Activity 4

Space travel

Technology Practice (Investigation, Ideation), Information, Systems

Links to Science:

SS 2.2 *Students identify some ways scientists think and work.*

1. Ask students whether people have always held the same beliefs about the things they could see in the sky. Discuss why people's beliefs may have changed.
2. Ask students to name technologies that have helped to increase our understandings about the moon, stars and planets — probes, satellites, telescopes.
3. Use a picture book such as *I Wish I'd Gone to the Moon with Neil Armstrong* to initiate discussion about space travel. Ask students:
   - What do we call devices for travelling into space?
   - Do all spacecraft carry people?
   - Why do people want to travel into space?
   - What do people need to travel into space?
   - How is space travel similar to travel on Earth? How is space travel different from travel on Earth? Why?
4. Add to the class word bank throughout the discussion.
5. Look at diagrams of Saturn 5 and Apollo 11 and maps of Apollo 11's trip to the moon and return to Earth. (A poster is provided with the book *I Wish I'd Gone to the Moon with Neil Armstrong*.) Read the labels on the spacecraft components. Compare the size of Apollo 11 — where the astronauts lived and controlled the flight — with Saturn 5 — the rocket that hurled Apollo 11 into space.
6. Discuss how the illustrations helped students to understand what the spacecraft looked liked and how it worked.
7. Students record ideas they might use in their own designs in their Technology project folios.

Activity 5

Looking at spacecraft

Technology Practice (Investigation), Information, Systems

1. Identify sources and forms of information related to spacecraft. Students collect pictures of spacecraft — rockets, moon buggies, spaceships, flying saucers, space shuttles, satellites, space telescopes.
2. Discuss how spacecraft can be grouped according to their shape, features or purposes.
3. Ask students to list the questions they might need to answer in order to design a spacecraft — for example:
   - Why are spacecraft sent into space? What purposes do they serve?
   - What inventions have made space travel possible?
   - What do spacecraft need to get into space? What is their power source?
   - What is it like in space? What can spacecraft encounter in space?
   - What materials are used to construct spacecraft?
   - What are the features of spacecraft? How do they function?
4. Students access information about spacecraft and space travel from a range of fiction and non-fiction sources, including books, videos and Internet websites such as NASA's. Encourage students to work with parents/carers at home to find additional sources of information and ideas.
5. Students record information about the sources they have found in their Technology project folios.

[Introductory activities continue on next page.]

Activity 6

Compare size, shape and distance

Technology Practice (Investigation, Ideation, Production), Information

Links to Mathematics

1. Read extracts from *A Book About Planets* or a similar book. Discuss how different forms are used to convey different types of information — for example, photographs, illustrations, diagrams and tables.
2. Find or create a table that shows the distance of all the planets from the sun; how long each planet takes to spin on its axis; how long they take to orbit the sun; their diameters; and the number of satellites each has. (There's a suitable table in the middle of *A Book About Planets*.)
3. Demonstrate how the information from the table can be converted into graphs by entering information into a spreadsheet program. Discuss whether the information is easier to compare in graph form or as a table.
4. Students use the resources collected in the previous activity to record information about spacecraft — their purpose, their sizes and shapes, the materials used in their construction, their power sources and the distances travelled. Assist students to display this information in tables. Discuss and negotiate table headings and labels for columns and rows. If adapting this module for older students, provide opportunities for students to use spreadsheet programs to collate and compare information.
5. Assist students to record their research results and to create graphs that can be used to compare information.
6. Students keep copies of spreadsheets and graphs in their Technology project folios.

Assessment

Sources of evidence could include:

- observations of students' participation in activities
- constellation maps, spreadsheet tables and graphs
- presentation of information about spacecraft in Technology project folios.

Developmental activities

Focus

The developmental activities provide opportunities for students to discuss the requirements and constraints of the design challenge, test the suitability of materials for design purposes, and generate designs for a cockpit playspace and/or a model spacecraft. Students communicate their designs using drawings and models, and comment on designs generated by others. They develop production procedures and use a range of materials and equipment to realise their designs.

Teaching considerations

Two design challenges are provided. Teachers and/or students can choose to undertake either or both design challenges.

During these activities, it is useful to have assistance from older students, a teacher's aide or parent/carer helpers. Explain the nature of the unit of work to helpers and outline specific activities, such as the Space Innovation Expo. Some parents/carers and interested community members might be able to donate materials and/or assist with activities.

Spend time discussing designs, production plans and construction processes with students. Encourage or assist them to record information from these discussions in their Technology project folios.

Resources

Technology project folios.

Illustrations or diagrams of spacecraft and the interiors of spacecraft.

Materials for presenting design ideas — chart paper, butcher's paper, collage material, pens, paints, glue.

Recycled materials that can be used or adapted to simulate parts of the cockpit.

Equipment for measuring, cutting, combining and decorating materials.

Activity 7

Design challenge 1
Design and construct a spacecraft cockpit playspace.

Systems that cater for human needs and wants

Technology Practice (Investigation, Evaluation), Information, Systems

Links to SOSE:

SRP 1.1 *Students identify how elements in their environment meet their needs and wants.*

1. Divide the class into groups. Introduce the design challenge. Explain that:
   - the purpose of the activity is to create a spacecraft cockpit playspace in an area of the classroom
   - each group will have opportunities to create or modify the cockpit and act out various aspects of life in space.
2. Refer to the information collected in earlier activities. Discuss the constraints of the design challenge — for example, space available on the spacecraft (and in the classroom) for the cockpit and the kinds of systems the astronauts will require to sustain them in space.
3. Ask students to list human needs and wants, and to identify household systems that are designed to meet these. Discuss how well these systems meet human needs and wants, and possible impacts of these systems on people and environments.
4. Assist students to:
   - collect photographs, illustrations or plans of household systems
   - identify the components and signs or symbols used in the household systems — brand names/logos, symbols or words on operating buttons, instructions or warnings
   - annotate the photographs, illustrations or plans with information about the system's components, signs and symbols
   - share what they have found with the class and discuss the purposes of the components, signs and symbols
   - decide which information or ideas can be used or adapted to meet the design challenge.

[Developmental activities continue on next page.]

Activity 8

Surviving in space

Technology Practice (Investigation, Ideation), Information, Materials, Systems

Links to The Arts (Visual Arts and Drama)

1. Encourage students to investigate the interior designs of spacecraft by reviewing the information they gathered in earlier activities. Discuss the needs and wants of astronauts and how they are met in spacecraft. Are their needs and wants the same in space as they would be on Earth?
2. Ask groups of students to collect pictures or descriptions of how astronauts meet their needs and wants in spacecraft. Ask each group to share the information they have found. Discuss and describe:
   - the characteristics of space, particularly the moon
   - what is needed to survive — for example, air, gravity
   - possible conditions in the cockpit and how these might affect the way the astronauts' needs and wants are met
   - the human support systems needed in the cockpit environment
   - the possible size and shape of the cockpit area of the spacecraft.
3. Ask each group to discuss, design and draw the layout of a cockpit environment. Their drawings should be annotated with information about:
   - how the astronauts meet their needs and wants in the cockpit environment
   - materials that could be used to create the cockpit playspace
   - the characteristics of materials that make them suitable.
4. Encourage students to use a range of media to prepare and present their design ideas.

Activity 9

Prepare for life in space

Technology Practice (Production), Information, Materials, Systems

1. Negotiate where in the classroom or school the cockpit playspace will be constructed. Over a period of time, provide each group with opportunities to construct or modify the cockpit and/or its props.
2. Encourage groups to:
   - discuss their designs
   - measure the area allocated for the cockpit playspace using arbitrary or metric measurements
   - annotate their designs with these measurements
   - suggest ways of improving or modifying the layout of the cockpit playspace
   - identify materials that could be used to create props for playspace
   - describe the characteristics of materials that make them suitable.
3. Assist students to design and create control panels for the cockpit. Their designs should include features such as icons, labels, images and instructions for communicating the purpose of particular features of the control panels.
4. Encourage groups to work cooperatively to test their design by planning and acting out take-off, landing and exploration procedures and life in space.
5. Discuss the effectiveness of each group's cockpit design and ask them to suggest modifications. Encourage students to annotate their designs with decisions.

[Developmental activities continue on next page.]

Activity 10

Space mission

Technology Practice (Ideation), Systems, Materials

Links to The Arts (Drama)

Design challenge 2

Design and make a model of a spacecraft that could take two astronauts into space.

1. Explain the concept of industry expos. Introduce the design challenge and explain that all students will be eligible to submit their designs to the class Space Innovation Expo that will be held at the end of the unit. Ask students to choose a mission for their space flight and design a spacecraft to carry out the mission.
2. Invite students to discuss their mission:
   - What is the purpose of the space mission?
   - What difficulties might the crew encounter?
   - What systems or equipment might be needed to complete the mission?
   - What will the spacecraft need to get into space?
   - Who will control the spacecraft?
   - What will they need to stay alive in space?
3. Assist students to identify the constraints of the design challenge and the possible implications of the constraints. These might include, for example, the destination is the moon and the spacecraft must take two astronauts.
4. Students work independently or in small groups to examine ideas they have collected about spacecraft designs. They:
   - examine the pictures and diagrams of spacecraft they have collected
   - discuss the features and components of spacecraft and the purpose of these features and components
   - list the features and components that their spacecraft will need
   - identify how the spacecraft will be powered and controlled
   - record relevant information and design ideas in their Technology project folios.
5. Students can present their design ideas using collage, drawings or paintings. Provide opportunities for students to share, discuss, evaluate and refine their spacecraft designs. Students record their decisions in their Technology project folios.

Activity 11

Selecting materials

Materials

1. Discuss the materials used to construct real spacecraft. Ask students to consider why they would have been chosen. What are their properties? Students annotate their design with information about the materials that might be used in the construction of a real spacecraft.
2. Students examine the recyclable materials available for making their spacecraft models. They discuss which of these materials, if any, are used to construct the body or interior of real spacecraft. Discuss why these materials would or wouldn't be used.
3. Students select materials for making their spacecraft models. They test materials and justify their selection by explaining why particular materials are suitable for their design purposes — for example, size, colour, strength, flexibility, weight or shape.
4. Students discuss their material requirements and make a class list. They discuss techniques that can be used to manipulate these materials. They discuss, for example, why cutting might be preferable to tearing. In their Technology project folios, students list or draw materials and equipment they intend to use.

Activity 12

Construct a spacecraft model

Technology Practice (Ideation, Production)

1. Students plan the construction of their model. Explain that they will have to consider which tasks should be done first, and how long tasks might take. Let students know how many sessions will be devoted to construction. Provide time for them to discuss, for example, what they might need to do first and what should be left until last — for example, painting, labelling.
2. Assist students to record their production plans in their Technology project folios. They might communicate their production plans by describing the procedure, drawing pictures or diagrams and/or writing simple instructions. Discuss their production plans.
3. Provide a number of sessions for students to construct their model spacecraft. At the end of each session, provide opportunities for students to record their progress and describe processes they have tried in their Technology project folios. Encourage students to explain how and why their designs have changed from their original ideas.
4. Encourage students to think about what materials and equipment they will need for the next session.

Assessment

Sources of evidence could include:

- observations of students' participation in brainstorming and discussions
- designs, production plans and annotations in Technology project folios
- observations of students constructing spacecraft models and the cockpit playspace or props
- observations of students roleplaying life in space.

Culminating activities

Focus

These activities provide opportunities for students to evaluate their spacecraft and make changes if required, and to discuss and display their spacecraft.

Teaching considerations

The Space Innovation Expo will provide students with further opportunities to provide evidence of demonstrations of learning outcomes. Invite parents/carers to attend.

Resources

Chart paper and pens.

Computers, digital cameras, scanners, and printers.

Spacecraft models.

Cockpit playspace and props.

Audiovisual equipment.

Activity 13

Evaluate spacecraft

Technology Practice (Evaluation)

1. Encourage students to evaluate their own work and the work of others by asking and answering questions about aspects of the spacecraft models and suggesting possible alternatives.
2. Ask students to compare their initial design ideas with their final products and to explain the reasons for differences between:
   - their designs and the final spacecraft models
   - the production plans and the actual processes used.
3. Encourage students to discuss their models in groups and evaluate how well their models conveyed their spacecraft designs. Provide feedback to the groups. If necessary, model this feedback process in a whole-class situation.
4. Assist students to use roleplay to evaluate their cockpit designs. Provide feedback to students on the performance of their spacecraft models during these roleplay activities.

Activity 14

Space Innovation Expo

Information

Links to The Arts and English

1. Assist students to plan the Space Innovation Expo. This may involve preparing:
   - expo submissions that describe their innovative spacecraft or cockpit design idea and what they learnt by constructing their spacecraft model or props for the cockpit
   - roleplays, freeze frames or other forms of entertainment.
2. Assist students to use a range of equipment such as tape recorders, digital cameras, scanners and computers to prepare their expo submissions. Assist them to select information and examples from their Technology project folios to support their submissions.
3. Display students' submissions at the Space Innovations Expo.

Assessment

Sources of evidence could include:

- observations of students' participation in discussions
- expo submissions
- observation of students' participation in the presentations and entertainment items at the Space Innovation Expo.

Acknowledgment and support materials

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NASA
www.nasa.gov
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Yahoo, Yahoo Directory Hobbies > Rockets
dir.yahoo.com/Recreation/Hobbies/Rockets/
Listing of the most popular rocket websites.

Yahoo, Yahooligan
search.yahooligans.com/search/ligans?p=rockets
A site for students that lists the results of a search on the key word of 'rockets'. Includes links to over 20 sites.

AccessEd Library Services
http://education.qld.gov.au/accessed/borrow/index.html#1
Provides access to the AccessEd Library catalogue and links to educational material.

This sourcebook module should be read in conjunction with the following Queensland Studies Authority materials:

Years 1 to 10 Technology Syllabus

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