



## **Technologies: Design and Technologies**

Teaching, learning and assessment exemplar

**Year 4**

**Engineering principles and systems;**

**Materials and technologies specialisations**



## **Acknowledgement of Country**

Kaya. The School Curriculum and Standards Authority (the Authority) acknowledges that our offices are on Whadjuk Noongar boodjar and that we deliver our services on the country of many traditional custodians and language groups throughout Western Australia. The Authority acknowledges the traditional custodians throughout Western Australia and their continuing connection to land, waters and community. We offer our respect to Elders past and present.

## **Background**

This teaching, learning and assessment exemplar (the exemplar) has been developed by the School Curriculum and Standards Authority (the Authority) as part of the *School Education Act Employees (Teachers and Administrators) General Agreement 2017* (Clause 61.1–61.3).

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## **Disclaimer**

Any resources such as texts, websites and so on that may be referred to in this document are provided as examples of resources that teachers can use to support their learning programs. Their inclusion does not imply that they are mandatory or that they are the only resources relevant to the course. Teachers must exercise their professional judgement as to the appropriateness of any they may wish to use.

This resource utilises electronic web-based resources, such as videos and image galleries. Teachers should be present while an electronic resource is in use and close links immediately after a resource, such as a video has played to prevent default 'auto play' of additional videos. Where resources are referred for home study, they should be uploaded through Connect, or an equivalent system, that filters advertising content.

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## The Western Australian Curriculum

The *Western Australian Curriculum and Assessment Outline (the Outline – <https://k10outline.scsa.wa.edu.au/>)* sets out the mandated curriculum, guiding principles for teaching, learning and assessment, and support for teachers in their assessment and reporting of student achievement. The *Outline* recognises that all students in Australian schools, or international schools implementing the Western Australian Curriculum, are entitled to be given access to the eight learning areas described in the *Alice Springs (Mparntwe) Education Declaration*, December 2019.

### The Technologies curriculum

The mandated curriculum is presented in the year level syllabus documents.

The Technologies curriculum delivers a sequential and age-appropriate progression of learning with the following key elements:

- a year level description that provides an overview of the context for teaching and learning in the year
- a series of content descriptions, populated through strands and sub-strands, that sets out the knowledge, understanding and skills that teachers are expected to teach and students are expected to learn
- an achievement standard that describes an expected level that the majority of students are achieving by the end of a given year of schooling. An achievement standard describes the quality of learning (e.g. the depth of conceptual understanding and the sophistication of skills) that would indicate the student is well placed to commence the learning required in the next year.



## **This exemplar**

This Technologies exemplar articulates the content in the *Outline* and approaches to teaching, learning and assessment reflective of the Principles of Teaching, Learning and Assessment. This exemplar presents planning for eight weeks of teaching and learning for each of the four terms, with a time allocation of one hour per week.

## **Catering for diversity**

This exemplar provides a suggested approach for the delivery of the curriculum and reflects the rationale, aims and content structure of the learning area. When planning the learning experiences, consideration has been given to ensuring that they are inclusive and can be used in, or adapted for, individual circumstances. It is the classroom teacher who is best placed to consider and respond to (accommodate) the diversity of their students. Reflecting on the learning experiences offered in this exemplar will enable teachers to make appropriate adjustments (where applicable) to better cater for students' gender, personal interests, achievement levels, socio-economic, cultural and language backgrounds, experiences and local area contexts.



### **Using this exemplar**

This teaching, learning and assessment exemplar provides suggestions to support the delivery of the mandated curriculum content. The exemplar provides:

- a teaching and learning sequence
- the mandated curriculum content to be taught at each point of the teaching and learning sequence, suggested resources, sample assessment tasks and marking keys
- the number of lessons to deliver the teaching and learning experiences
- learning intentions and support notes that may provide focus questions and additional information and/or examples to assist with the interpretation of curriculum content
- support notes to assist teachers to unpack the content and support teaching and learning experiences
- teaching and learning experiences that outline the structure of the lesson. These explicitly state each activity that the lesson will progress through and the key focus area for that activity.

### **Links to electronic resources**

This sequence of lessons may utilise electronic web-based resources, such as videos and image galleries. Teachers should be present while an electronic resource is in use and close links immediately after a resource, such as a video, has played to prevent default 'auto play' of additional videos. Where resources are referred for home study, they should be uploaded through Connect, or an equivalent system, that filters advertising content.



## Best practice

### Teaching and learning

The teaching and learning opportunities offered in this exemplar are not exhaustive. Thus, teachers are encouraged to make professional decisions about which learning experiences, and the sequence in which they are delivered, are best suited to their classroom context, taking into account the availability of resources and student ability.

This sample may prove a useful starting point for amplifying creativity in the classroom, while presenting the embedded expectations of the Western Australian Curriculum: Technologies.

Teachers may find opportunities to incorporate the General Capabilities and the Cross-curriculum Priorities into the teaching and learning program.

**Ways of teaching** – teachers can locate additional information on the Ways of teaching from the School Curriculum and Standards Authority (the Authority) website

<https://k10outline.scsa.wa.edu.au/home/wa-curriculum/learning-areas/technologies/design-and-technologies/p-10-design-and-technologies-teaching/design-and-technologies-ways-of-teaching>.

### Assessing

Assessment, both formative and summative, is an integral part of teaching and learning. Assessment should arise naturally out of the learning experiences provided to students. In addition, assessment should provide regular opportunities for teachers to reflect on student achievement and progress. As part of the support it provides for teachers, this exemplar includes suggested assessment points. It is the teacher's role to consider the contexts of their classroom and students, the range of assessments required, and the sampling of content descriptions selected to allow their students the opportunity to demonstrate achievement in relation to the year level achievement standard. Teachers are best placed to make decisions about whether the suggested assessment/s are used as formative or summative assessment and/or for moderation purposes.

**Ways of assessing** – a range of assessment strategies that can enable teachers to understand where students are in their learning is available on the Authority website

<https://k10outline.scsa.wa.edu.au/home/wa-curriculum/learning-areas/technologies/design-and-technologies/p-10-design-and-technologies-assessing/design-and-technologies-ways-of-assessing>.

### Reflecting

Reflective practice involves a cyclic process during which teachers continually review the effects of their teaching and make appropriate adjustments to their planning. The cycle involves planning, teaching, observing, reflecting and replanning.

This exemplar supports reflective practice and provides flexibility for teachers in their planning. The exemplar shows how content can be combined and revisited throughout the year. Teachers will choose to expand or contract the amount of time spent on developing the required understandings and skills according to their reflective processes and professional judgements about their students' evolving learning needs.



## Year level description

In the middle to late childhood phase of schooling, students develop a sense of self, their world expands, and they begin to see themselves as members of larger communities. Learning experiences emphasise and lead to an appreciation of both the commonality and diversity of human experience and concerns.

Design and Technologies builds on concepts previously acquired and students continue to develop an understanding of design thinking skills, such as properties of materials and outlining step-by-step procedures. They have opportunities to create a range of solutions, including the reuse, repurpose and recycle of materials, and select materials from regenerated sources.

In Year 4, students have opportunities to learn about technologies in society and the diverse roles for people in design and technologies occupations and create solutions in at least one of the following Design and Technologies contexts: Engineering principles and systems, Food and fibre production, Food specialisations, and Materials and technologies specialisations. Students consider the way products, services and environments are designed to meet community needs, including consideration of sustainable factors.

Students define solutions to meet specific needs and consider society's use of technologies that meet community requirements and implement project management protocols, appropriate technologies, components and equipment to produce designed solutions. They use agreed protocols and management roles to communicate ideas, plan and make decisions to develop solutions to achieve a purpose. Students use given criteria to evaluate design features, selection of resources, and decision-making processes.

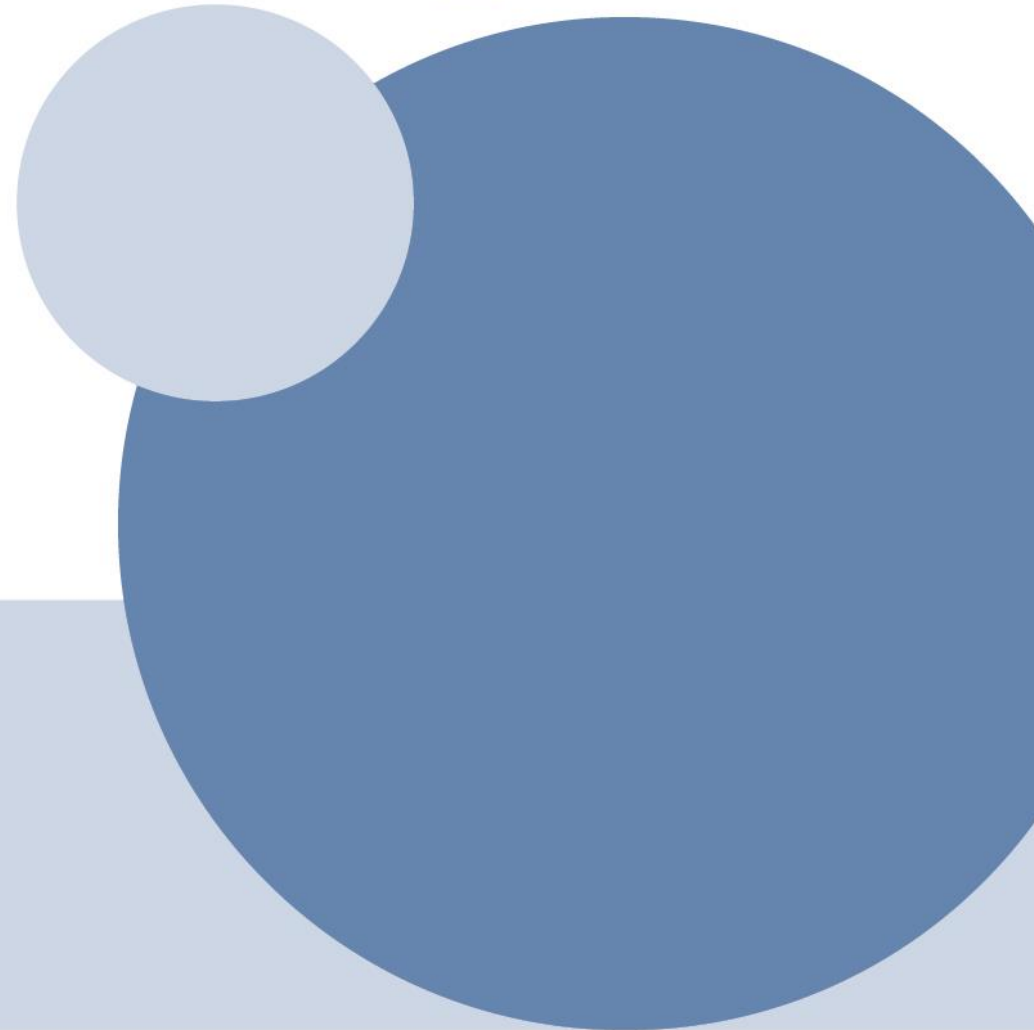
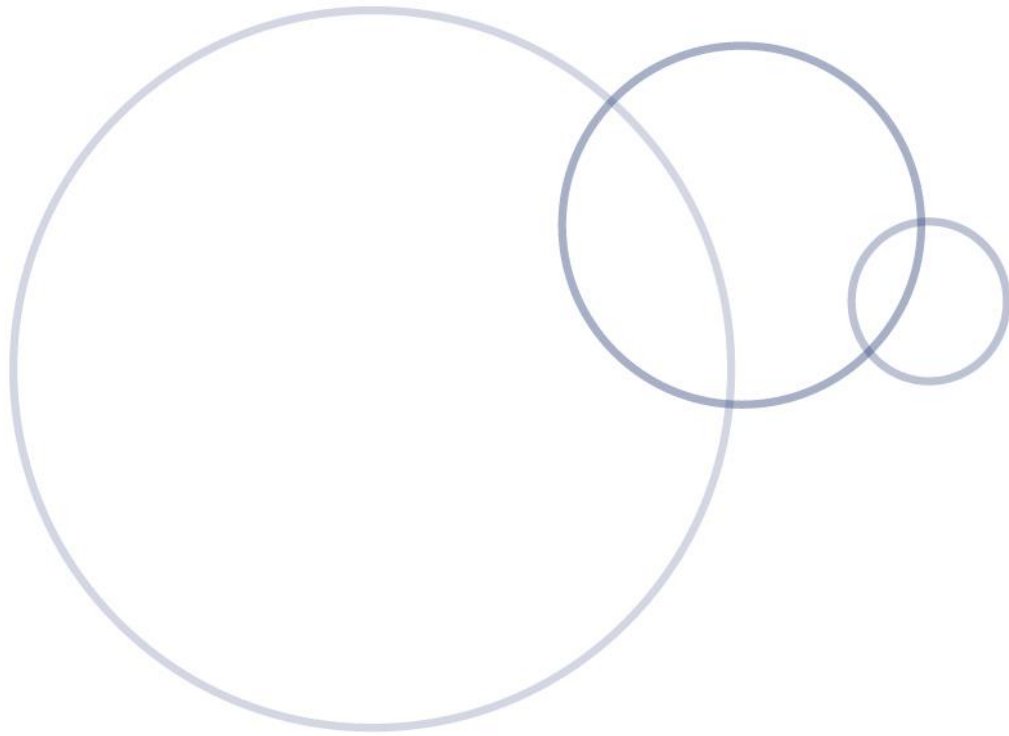


## Achievement standard

By the end of the year:

Students recognise diverse roles people in Design and Technologies occupations have in the community. They consider ways products, services and/or environments are designed to achieve planned solutions that meet community needs, considering sustainable factors. In Engineering principles and systems, students recognise ways forces and properties of materials affect the behaviour of an object or system. In Food and fibre production, students explore ways technologies are used in a range of environments, cultures and/or time periods for food and natural fibre production. In Food specialisations, students select and prepare food, considering a range of physical properties. In Materials and technologies specialisations, students select materials and components for preferred properties, suitability and function for a range of purposes.

In the Design and Technologies contexts, students investigate and select resources suitable for a designed solution to achieve a given task. Students manage, communicate and define ideas using labelled drawings, appropriate technical terms, decision-making and/or a sequence of steps. They implement agreed protocols, appropriate technologies and components to produce designed solutions. Students use given criteria to evaluate design features, selected resources and solutions for a given task. They use management roles to plan, communicate ideas and make decisions to safely achieve designed solutions.



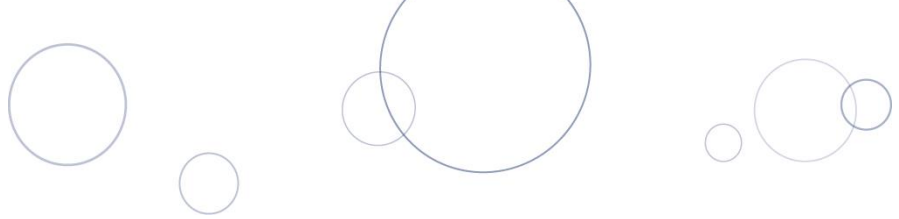
## **Term 1**

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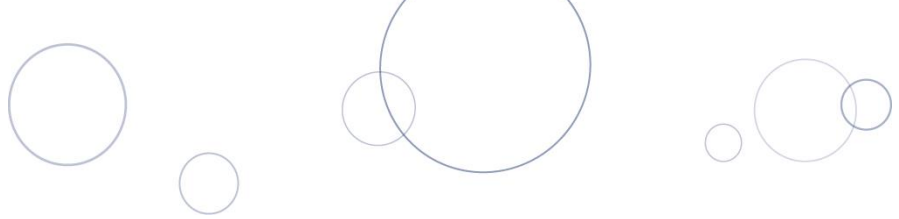
Weeks 1–8: Engineering principles and systems

## Term 1 Week 1: What is a force?

| Western Australian Curriculum content   | Teaching and learning intentions  | Learning experiences   |
|---|---|--|
| <p><b>Contexts</b></p> <p><b>Engineering principles and systems</b><br/>Forces, and the properties of materials affect the behaviour of an object or system</p> <p><b>Design thinking skills</b></p> <p><b>Project Management</b><br/>Use agreed protocols and management roles to communicate ideas, plan and make decisions, to develop solutions</p> <p><b>Producing and implementing</b><br/>Use appropriate technologies, components and/or equipment and follow agreed protocols to produce a designed solution</p> | <p><b>Learning intention</b><br/>To understand and experiment with how forces can impact movement in a contact or non-contact way.</p> <p><b>Focus questions</b></p> <ul style="list-style-type: none"> <li>• What is a force?</li> <li>• What is an example of contact force?</li> <li>• On which surface did the marble move the fastest/slowest?</li> <li>• On which surface did the marble move the longest/shortest distance?</li> <li>• Why was speed and distance travelled different for each surface?</li> </ul> <p><b>Support notes</b><br/>A force is a push or a pull. It includes contact force, where the force needs contact to occur, like pushing a chair or bouncing a ball, and non-contact force, which doesn't need contact to occur, such as gravity or magnetism. Forces can make an object move, stop, speed up or slow down. Examples of non-contact force include an apple falling from a tree (gravity) and a paper clip being attracted to a magnet (magnetism).</p> <p>Examples of contact force in everyday life include pushing in a chair, kicking a ball, pulling out a drawer, stretching an elastic band and slowing down on a bike (the brakes need to touch the wheel to create friction).</p> | <p><b>Introduction</b></p> <ul style="list-style-type: none"> <li>• Activate prior knowledge and ask students the first focus question.</li> <li>• Students conduct a think-pair-share and share their responses with the class.</li> <li>• Select and show one of the suggested videos on force (Appendix A.1).</li> <li>• Discuss and brainstorm examples of using contact force in everyday life. Provide each student or pair with a marble and straw and explain that they will be applying force to move the marble across different flat surfaces.</li> <li>• Discuss safety considerations and the need to ensure a fair test.</li> </ul> <p><b>Learning activity</b></p> <ul style="list-style-type: none"> <li>• Assign students with management roles and discuss how they will manage conducting the test.</li> <li>• Individually, students blow into the straw to make the marble move across different surfaces.</li> <li>• Use the focus questions to discuss the marble's speed and distance across each surface.</li> </ul> <p><b>Conclusion</b></p> <ul style="list-style-type: none"> <li>• Students complete an exit ticket, with the provocation 'Today I learned ...' to demonstrate their understanding of concepts taught.</li> </ul> |



| Western Australian Curriculum content | Teaching and learning intentions   | Learning experiences |
|---------------------------------------|--|----------------------|
|                                       | <p>The search phrase 'examples of contact force' or 'examples of non-contact force' will provide further examples.</p> <p>Discuss safety considerations with students before they conduct the learning experience. This includes not throwing the marble and not sharing straws.</p> <p>To ensure a fair test, students must use the same level of force to make the marble move across different surfaces, i.e. the same breath out and the straw the same distance away from the marble. Instead of straws, students could also either flick or lightly roll the marble. Different surfaces include carpet, smooth surfaces, such as a tabletop or vinyl floor, a concrete surface and grass. The speed and distance the marble travels will be impacted by the level of sliding friction of the surface. A smoother floor surface has less resistance against the marble.</p> <p><b>Suggested assessment points</b></p> <p>The exit ticket may be used as formative assessment.</p> |                      |

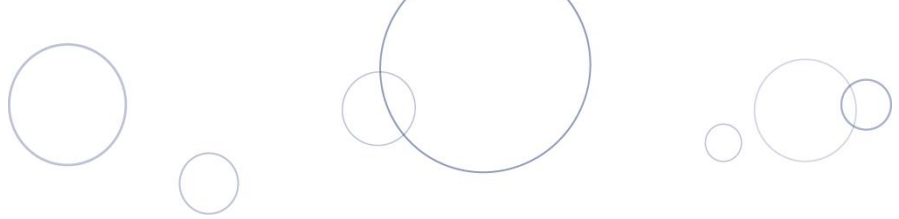


## Term 1 Week 2: Simple machines

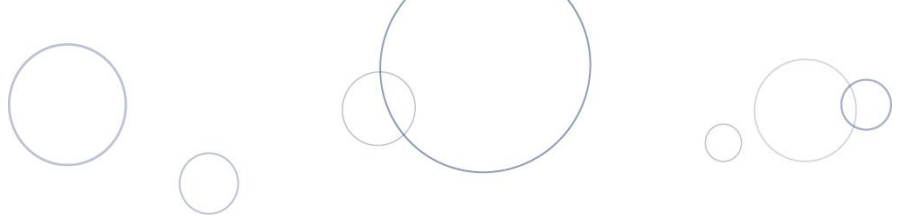
| Western Australian Curriculum content  | Teaching and learning intentions  | Learning experiences   |
|--|---|--|
| <p><b>Contexts</b></p> <p><b>Engineering principles and systems</b><br/>Forces, and the properties of materials affect the behaviour of an object or system</p> <p><b>Technologies and society</b><br/>Products, services and/or environments are designed to meet community needs, including consideration of sustainable factors</p> <p><b>Design thinking skills</b></p> <p><b>Designing</b><br/>Design solutions through use of labelled drawings, technical terms, decision-making and/or a sequence of steps</p> | <p><b>Learning intention</b><br/>To understand the uses of simple machines in everyday life.</p> <p><b>Focus questions</b></p> <ul style="list-style-type: none"> <li>• What is a simple machine?</li> <li>• Where are simple machines used in everyday life?</li> <li>• Why were simple machines invented?</li> <li>• What community need has been met with the invention of simple machines?</li> </ul> <p><b>Support notes</b><br/>A simple machine is a machine with very few or no moving parts. They were designed to make work easier so less force and effort was needed. The six simple machines are screw, pulley, lever, wedge, inclined plane and wheel and axle.</p> <p>Simple machines are used daily. For instance, scissors are made up of a lever and a wedge. A slide is an inclined plane. A rolling pin is made up of a wheel and axle. A lid on a jar is a screw.</p> <p>Further examples of simple machines in everyday life can be found at <a href="https://sciencing.com/types-simple-machines-found-home-6387889.html">https://sciencing.com/types-simple-machines-found-home-6387889.html</a>.</p> | <p><b>Introduction</b></p> <ul style="list-style-type: none"> <li>• Show a video song about simple machines (Appendix A.1).</li> <li>• Identify the six types of simple machines with students.</li> <li>• Brainstorm with students where simple machines are found and used in day-to-day life.</li> </ul> <p><b>Learning activity</b></p> <ul style="list-style-type: none"> <li>• In pairs, students go on a scavenger hunt to find simple machines around the school.</li> <li>• Students sketch/take photos of two objects which use simple machines and label the image.</li> <li>• Ask students to identify the simple machine and discuss how it makes using the object/tool easier.</li> </ul> <p><b>Conclusion</b></p> <ul style="list-style-type: none"> <li>• Invite students to share the simple machines they found on the scavenger hunt.</li> <li>• Discuss the purpose of simple machines and the importance of their invention.</li> </ul> |

## Term 1 Weeks 3–4: Rube Goldberg machines

| Western Australian Curriculum content   | Teaching and learning intentions   | Learning experiences   |
|---|--|--|
| <p><b>Contexts</b></p> <p><b>Engineering principles and systems</b><br/>Forces, and the properties of materials affect the behaviour of an object or system</p> <p><b>Design thinking skills</b></p> <p><b>Designing</b><br/>Design solutions through use of labelled drawings, technical terms, decision-making and/or a sequence of steps</p> | <p><b>Learning intention</b><br/>To understand how force works in Rube Goldberg machines.</p> <p><b>Focus questions</b></p> <ul style="list-style-type: none"> <li>• What is a Rube Goldberg machine?</li> <li>• What simple machines can be found in this design?</li> <li>• Does the Rube Goldberg machine make work easier?</li> <li>• What forces are used in the Rube Goldberg machine?</li> <li>• Where does movement become faster in the machine? Why?</li> <li>• Where does movement become slower in the Rube Goldberg machine? Why?</li> </ul> <p><b>Support notes</b><br/>Rube Goldberg was an American cartoonist who drew invention cartoons depicting an overly complicated machine whose only purpose was to complete a simple task, such as turning on a light, though in a very indirect and complex manner. An example of one of his invention cartoons could be shown to students. While he never made any of his cartoon designs, his pictures inspired people to design and build complicated machines to perform a simple task.</p> | <p><b>Introduction</b></p> <ul style="list-style-type: none"> <li>• Discuss the background of Rube Goldberg machines and their purpose. Show a video showing an example of a Rube Goldberg machine in action. Highlight the machine’s purpose. See Appendix A.1 for video details and other Rube Goldberg machines.</li> <li>• Replay the video but pause throughout and ask students to identify where simple machines have been used in the machine.</li> <li>• Use the last three focus questions to guide a discussion.</li> </ul> <p><b>Learning activity</b></p> <ul style="list-style-type: none"> <li>• In pairs, students investigate simple Rube Goldberg machines, using either images or videos.</li> <li>• Using either screenshots or downloaded photos, students identify and label the simple machines in the Rube Goldberg design as well as the materials used to make the design.</li> <li>• If time permits, provide students with the opportunity to design their own machine.</li> </ul> |

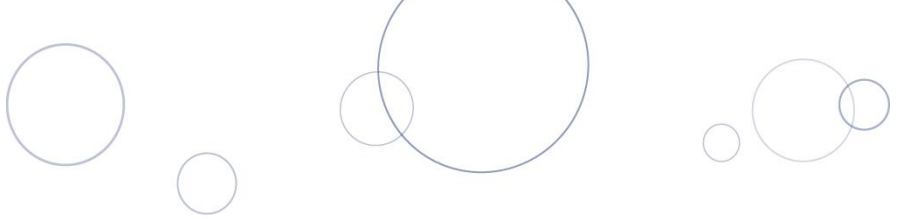


| Western Australian Curriculum content | Teaching and learning intentions  | Learning experiences |
|---------------------------------------|---|----------------------|
|                                       | <p>The first website listed in Appendix A.1 includes a video of simple Rube Goldberg machines made by children. It also has ideas for designing and constructing a Rube Goldberg machine.</p> <p><b>Suggested assessment points</b></p> <p>The design annotation on Rube Goldberg machine will help to determine what additional teaching is required in the following design lesson using marble runs.</p> |                      |

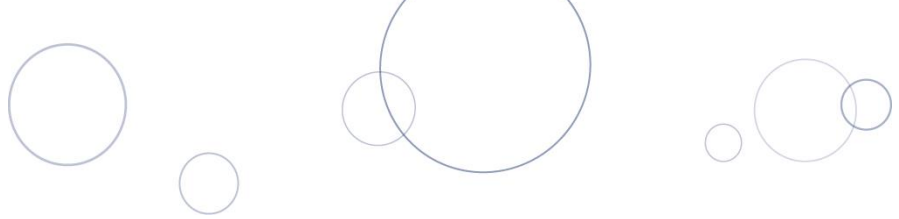


## Term 1 Weeks 5–6: Marble run speed

| Western Australian Curriculum content   | Teaching and learning intentions  | Learning experiences   |
|---|---|--|
| <p><b>Contexts</b></p> <p><b>Engineering principles and systems</b><br/>Forces, and the properties of materials affect the behaviour of an object or system</p> <p><b>Design thinking skills</b></p> <p><b>Designing</b><br/>Design solutions through use of labelled drawings, technical terms, decision-making and/or a sequence of steps</p> | <p><b>Learning Intention</b><br/>To understand the design features of marble runs that will use materials to affect the marble’s speed.</p> <p><b>Focus questions</b></p> <ul style="list-style-type: none"> <li>• What is a marble run?</li> <li>• What will impact the speed of the marble?</li> <li>• How will your design make the marble move quickly/slowly?</li> </ul> <p><b>Support notes</b><br/>The design task is to make two separate marble runs with the challenge of making a fast marble run and a slow marble run. Students will need to consider which materials to use to support the design challenge.</p> <p>The purpose of a marble run is for the marble or similar ball to run through a maze from start to finish or from top to bottom. Plan for the collection of resources required Week 7, such as cardboard rolls, wooden blocks, stop watches, straws and marbles.</p> <p>The search phrases ‘homemade marble run’ or ‘DIY marble run’ will bring up images and videos of marble runs on the internet. Commercially made marble runs can also be searched.</p> | <p><b>Introduction</b></p> <ul style="list-style-type: none"> <li>• Inform students of the design task to build two marble runs: one designed for the marble to move through slowly, and another where the marble will move through quickly.</li> <li>• Discuss with students the purpose of a marble run. Show students an image or video of either a homemade or commercially made marble run.</li> <li>• Model labelling an image of a homemade marble run, including the materials used. Ask students to discuss if they think the marble run would make a marble move slowly or quickly.</li> </ul> <p><b>Learning activity</b></p> <ul style="list-style-type: none"> <li>• Put students into groups of four and provide each group with a different image of a homemade marble run.</li> <li>• In groups, students label the provided image, including materials used and if they believe the marble will move quickly or slowly through the run.</li> <li>• Using sticky notes, students write ideas in response to the second focus question. Student responses will be used to formulate questions in the subsequent learning experience.</li> </ul> |



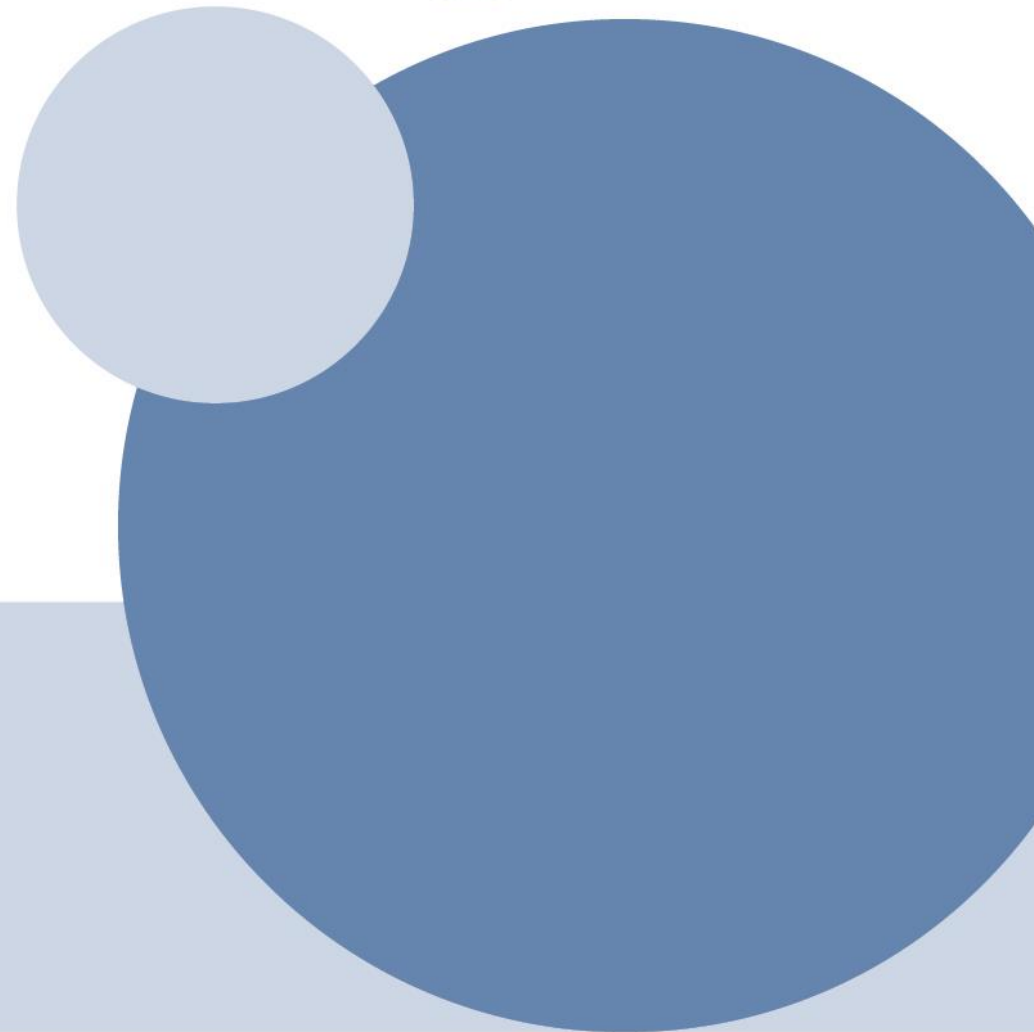
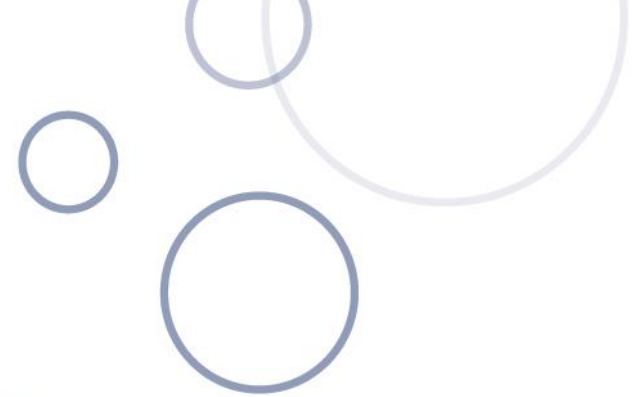
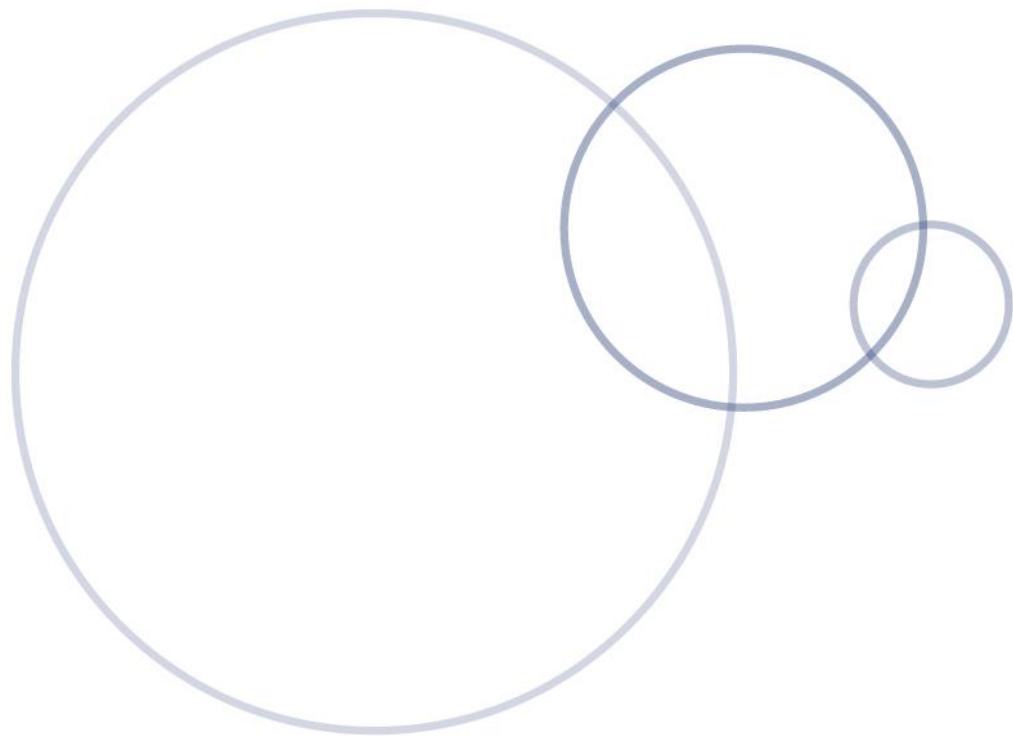
| Western Australian Curriculum content | Teaching and learning intentions | Learning experiences  |
|---------------------------------------|----------------------------------|---|
|                                       |                                  | <b>Conclusion</b><br>Share ideas as a class, emphasising and discussing the design features of a marble run that would affect the marble's speed. |



## Term 1 Weeks 7–8: Marble run materials

| Western Australian Curriculum content   | Teaching and learning intentions   | Learning experiences  |
|---|--|---|
| <p><b>Contexts</b></p> <p><b>Engineering principles and systems</b><br/>Forces, and the properties of materials affect the behaviour of an object or system</p> <p><b>Design thinking skills</b></p> <p><b>Project management</b><br/>Use agreed protocols and management roles to communicate ideas, plan and make decisions, to develop solutions</p> <p><b>Investigating and defining</b><br/>Investigate and select resources based on properties for the given task</p> <p><b>Evaluating</b><br/>Use given criteria to evaluate design features, selected resources, decision-making processes and the designed solution</p> | <p><b>Learning intention</b><br/>To experiment with and reflect on how materials and forces are at work in two comparable marble runs.</p> <p><b>Focus questions</b></p> <ul style="list-style-type: none"> <li>• What materials will help a marble to move quickly through a marble run?</li> </ul> <p><b>Support Notes</b><br/>Changing the statements into a question will form the basis of investigations students will carry out before they design and make their own marble runs. For instance, a statement, such as ‘I think the slope of the run will impact on the speed,’ can be changed to ‘Does slope affect the speed of a marble?’</p> <p><b>Suggested assessment points</b><br/>The design task with annotations and subsequent evaluation of the marble runs can be used as a summative assessment for students this term, using the learning intentions linked with the curriculum as criteria.</p> <p>Provide a range of materials for students to conduct their investigations, such as cardboard rolls, wooden blocks, stop watches, straws, various boxes and containers.</p> | <p><b>Introduction</b></p> <ul style="list-style-type: none"> <li>• Discuss student responses on sticky notes from the previous learning experience.</li> <li>• Model changing one of the statements into a question.</li> <li>• In pairs, students rewrite at least two of the statements into questions.</li> </ul> <p><b>Learning activity</b></p> <ul style="list-style-type: none"> <li>• Explain that students will be investigating their questions using the materials provided. Emphasise that they are not focused on building a complex marble run but on conducting tests to determine what would make a marble move slowly or quickly.</li> <li>• Provide students with the materials to conduct their investigations.</li> <li>• In pairs, students list the materials needed to carry out their investigations based on their two questions.</li> <li>• Students carry out investigations to answer their two questions.</li> <li>• Students take photos or draw their investigations to label the materials and write their findings.</li> </ul> <p><b>Conclusion</b></p> <ul style="list-style-type: none"> <li>• Invite students to share their results with the class.</li> <li>• Guide a discussion to evaluate the variation in success using different types of materials.</li> </ul> |

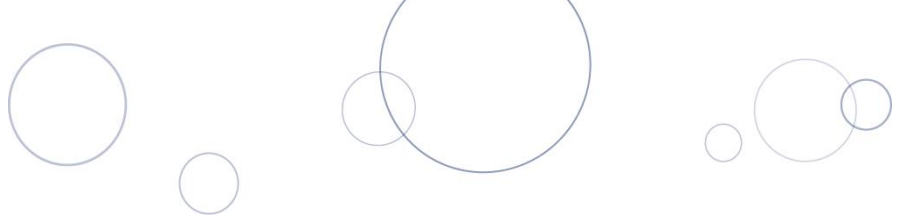




## **Term 2**

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Weeks 1–8: Engineering principles and systems



## Term 2 Weeks 1–2: Marble run design

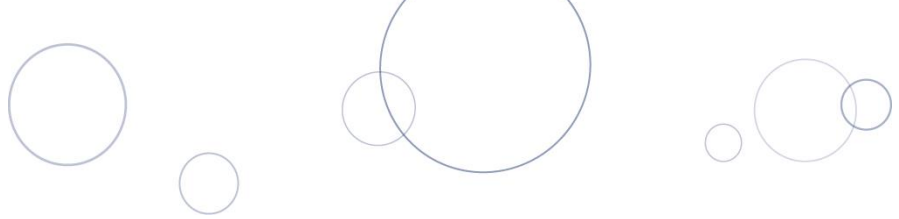
| Western Australian Curriculum content   | Teaching and learning intentions  | Learning experiences  |
|---|---|---|
| <p><b>Contexts</b></p> <p><b>Engineering principles and systems</b><br/>Forces, and the properties of materials affect the behaviour of an object or system</p> <p><b>Design thinking skills</b></p> <p><b>Designing</b><br/>Design solutions through use of labelled drawings, technical terms, decision-making and/or a sequence of steps</p> | <p><b>Learning intention</b><br/>To design two different marble runs with properties that affect their individual speeds.</p> <p><b>Focus questions</b></p> <ul style="list-style-type: none"> <li>• How will you make sure your marble moves slowly/quickly through the marble run?</li> <li>• What surfaces will affect the speed of the marble?</li> <li>• How does non-contact force affect the speed of the marble?</li> </ul> <p><b>Support notes</b><br/>The design task is to make two separate marble runs with the challenge of making a fast marble run and making a slow marble run. Students will need to consider which materials to use to support the design challenge.</p> <p>Non-contact force, such as gravity, will affect how quickly a marble will roll. For instance, the steeper the incline or slope the faster the marble will roll.</p> <p>Gather and store materials and equipment. Students bring any identified materials from home and source some resources from the school.</p> <p><b>Suggested assessment points</b><br/>The annotated designs may be used for summative assessment, based on knowledge from the previous term and learnings from this term from within the curriculum design criteria.</p> | <p><b>Introduction</b></p> <ul style="list-style-type: none"> <li>• Review the results from the investigations carried out in the previous learning experiences. Refer to the annotated images of marble runs from Term 1 Weeks 5 and 6. Model sketching and labelling a design of one of the images.</li> <li>• Give an overview of the design task, using the focus questions to guide a class discussion.</li> <li>• Discuss with students which materials can be brought from home.</li> </ul> <p><b>Learning activity</b></p> <ul style="list-style-type: none"> <li>• Independently, students sketch two designs that include labels. In the labelled sketches, students identify features such as slope or incline, any chutes or mazes (as well as the materials used to make them), and the start and end point for the marble.</li> <li>• Students develop a list of materials, tools and equipment needed to make the two marble runs. The list of materials needs to include how the marble run will be joined/stuck together, such as sticky tape or glue.</li> </ul> <p><b>Conclusion</b></p> <ul style="list-style-type: none"> <li>• Share some student sketches with the class and discuss ideas for materials.</li> </ul> |

## Term 2 Week 3: Marble run instructions

| Western Australian Curriculum content  | Teaching and learning intentions  | Learning experiences   |
|--|---|--|
| <p><b>Contexts</b></p> <p><b>Engineering principles and systems</b><br/>Forces, and the properties of materials affect the behaviour of an object or system</p> <p><b>Design thinking skills</b></p> <p><b>Investigating and defining</b><br/>Define the features of a design brief and the requirements of a design task for a community need</p> | <p><b>Learning Intention</b><br/>To develop a design brief explaining how to create a successful marble run.</p> <p><b>Focus questions</b></p> <ul style="list-style-type: none"> <li>• If someone else was to make your marble runs, what instructions would you give?</li> <li>• What are the safety risks when building the marble runs?</li> </ul> <p><b>Support notes</b><br/>Safety risks depend on materials and joining tools used. For instance, using scissors to cut cardboard rolls in half is a safety risk.</p> <p>The sequence of steps will need to include if any materials, such as cardboard rolls, will be cut lengthwise and how the design will be put together.</p> <p>Students will begin building their marble runs in Week 4.</p> <p><b>Suggested assessment points</b><br/>Use the sequence of steps written by the students for assessment of learning.</p> | <p><b>Introduction</b></p> <ul style="list-style-type: none"> <li>• Use the first focus question to guide a discussion about developing instructions for making a marble run.</li> <li>• Model writing a sequence of steps using one of the photos from the students' investigations. Use vocabulary that models the features discussed, such as incline, slope and speed. List some important vocabulary on the board to inspire the students.</li> <li>• Discuss the safety risks when building the marble runs.</li> </ul> <p><b>Learning activity</b></p> <ul style="list-style-type: none"> <li>• Students independently write a sequence of steps to make each marble run. Guide them to reflect on any additional requirements and considerations when designing the marble run, such as the safety risks.</li> </ul> <p><b>Conclusion</b></p> <ul style="list-style-type: none"> <li>• If time permits, pair the students off and have them read through each other's instructions. Students give each other feedback on the clarity of their instructions and suggest possible improvements.</li> </ul> |

## Term 2 Weeks 4–5: Marble run construction

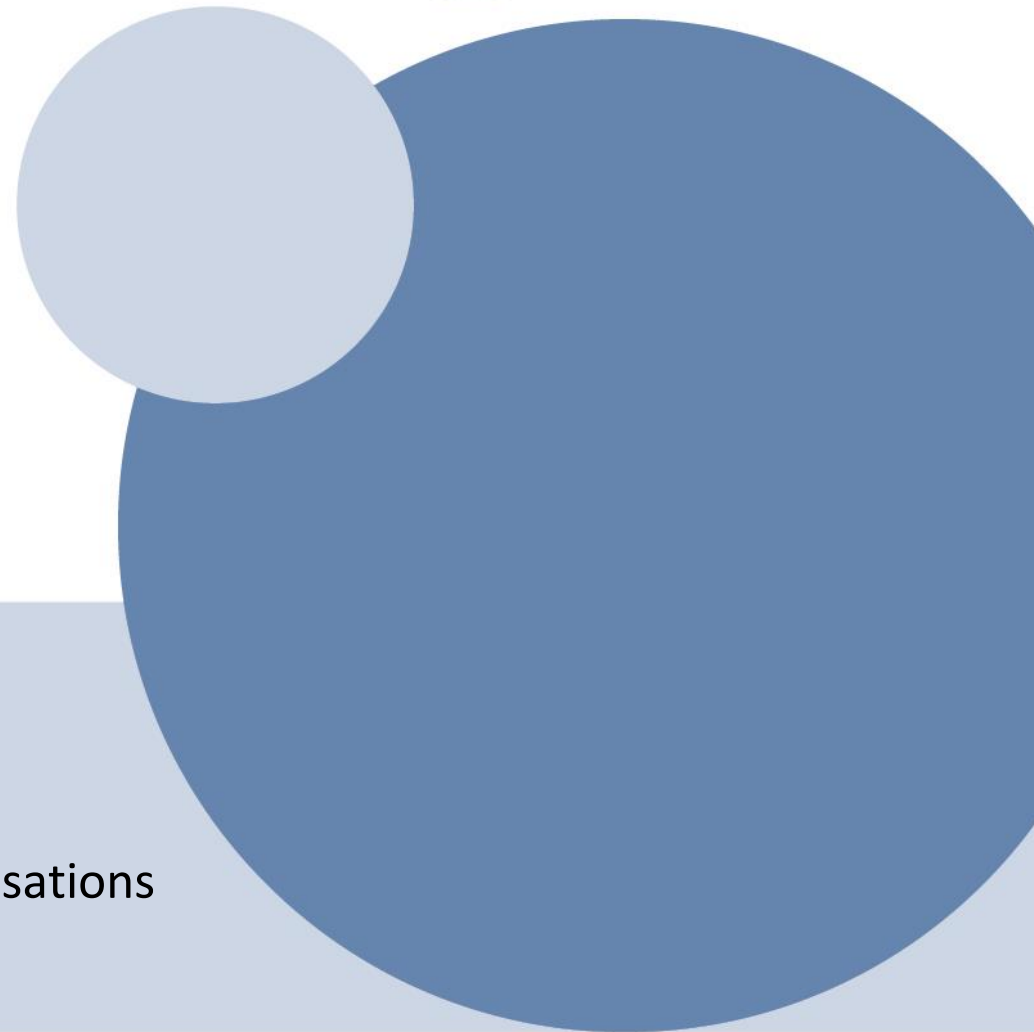
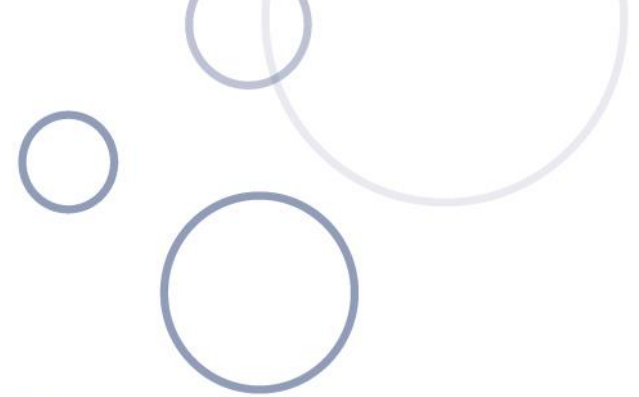
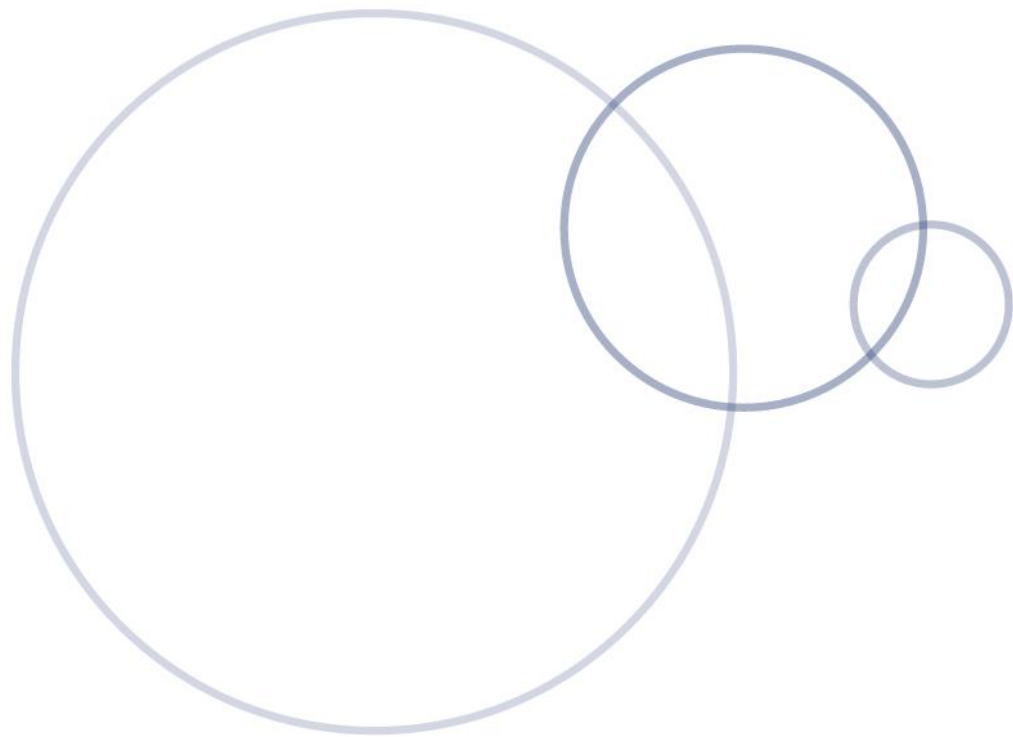
| Western Australian Curriculum content   | Teaching and learning intentions   | Learning experiences  |
|---|--|---|
| <p><b>Contexts</b></p> <p><b>Engineering principles and systems</b><br/>Forces, and the properties of materials affect the behaviour of an object or system</p> <p><b>Design thinking skills</b></p> <p><b>Project management</b><br/>Use agreed protocols and management roles to communicate ideas, plan and make decisions, to develop solutions</p> <p><b>Investigating and defining</b><br/>Investigate and select resources based on properties for the given task</p> <p><b>Producing and implementing</b><br/>Use appropriate technologies, components and/or equipment and follow agreed protocols to produce a designed solution</p> <p><b>Evaluating</b><br/>Use given criteria to evaluate design features, selected resources, decision-making processes and the designed solution</p> | <p><b>Learning Intention</b><br/>To create two successful marble runs using various forces following the designed solution.</p> <p><b>Focus questions</b></p> <ul style="list-style-type: none"> <li>• How will you know if your designs are successful?</li> <li>• What changes would you make to your design and why?</li> </ul> <p><b>Support notes</b><br/>The criteria for the design task is that one of the marble runs must make the marble move slowly and one must make the marble move quickly from start to finish.<br/><br/>Other criteria could include ease of construction and a clear start and finish point for the marble.<br/><br/>The final evaluation could be carried out by a peer.</p> <p><b>Suggested assessment points</b><br/>Photos of the marble runs, design sketches, sequence of steps and evaluations could be gathered for assessment purposes.<br/><br/>Observe safe use of equipment.</p> | <p><b>Introduction</b></p> <ul style="list-style-type: none"> <li>• Review the design task. As a class, discuss how engineering designs are often not successful on the first build and adjustments may be required.</li> <li>• Review safety and organisational instructions for completing a successful marble run within the constraints of the classroom.</li> </ul> <p><b>Learning activity</b></p> <ul style="list-style-type: none"> <li>• Students independently construct their two marble runs using their sequence of steps and following agreed safety protocols. Constructed runs should be tested and adjustments made where necessary. Students should note the adjustments and provide reasons why the adjustments were made.</li> <li>• Students evaluate their completed designs on completion of construction against the design criteria.</li> </ul> <p><b>Conclusion</b></p> <ul style="list-style-type: none"> <li>• If time permits, students can showcase their marble runs and receive feedback from their peers in the form of ‘two stars and a wish’.</li> </ul> |



## Term 2 Weeks 6–8: Assessment task

| Western Australian Curriculum content  | Teaching and learning intentions   | Learning experiences   |
|--|--|--|
| <p><b>Contexts</b></p> <p><b>Engineering principles and systems</b><br/>Forces, and the properties of materials affect the behaviour of an object or system</p> <p><b>Design thinking skills</b></p> <p><b>Project management</b><br/>Use agreed protocols and management roles to communicate ideas, plan and make decisions, to develop solutions</p> <p><b>Investigating and defining</b><br/>Investigate and select resources based on properties for the given task</p> <p><b>Designing</b><br/>Design solutions through use of labelled drawings, technical terms, decision-making and/or a sequence of steps</p> <p><b>Producing and implementing</b><br/>Use appropriate technologies, components and/or equipment and follow agreed protocols to produce a designed solution</p> <p><b>Evaluating</b><br/>Use given criteria to evaluate design features, selected resources, decision-making processes and the designed solution</p> | <p><b>Learning intention</b><br/>To design and create a rubber band racer that uses force to move from one place to another.</p> <p><b>Focus questions</b></p> <ul style="list-style-type: none"> <li>• How might force work on the car?</li> <li>• Does this impact the positioning of the rubber band, and why?</li> <li>• What roles will each member of the group have to ensure efficiency and success?</li> <li>• What materials are required to create the car?</li> <li>• What improvements and adjustments need to be made to the initial design, and why?</li> </ul> <p><b>Support notes</b><br/>Teachers may choose to extend the time spent on the learning experiences in this task, in preference to the time spent completing marble runs.</p> <p><b>Suggested assessment points</b><br/>In small groups, students create a rubber band powered car using provided resources and then evaluate the effectiveness of the car. After evaluation, students collaboratively investigate rubber band-powered cars and make suggestions on how to improve their design. Students independently redesign an improved rubber band racer and then, as a group, select the most effective design or combination of designs to produce. In groups, students construct the new rubber band racer.</p> | <p><b>Assessment exemplar – Rubber band racer</b><br/>Instructions, plans and a marking key are in Appendix B.</p> |





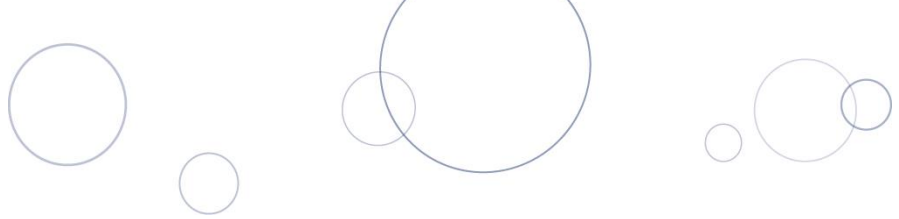
## **Term 3**

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Weeks 1–8: Materials and technologies specialisations

## Term 3 Week 1: Playgrounds

| Western Australian Curriculum content  | Teaching and learning intentions  | Learning experiences  |
|--|---|---|
| <p><b>Contexts</b></p> <p><b>Materials and technologies specialisations</b><br/>Properties of materials and components for a range of purposes affect suitability and function in a system</p> <p><b>Technologies and society</b><br/>Diverse roles for people in design and technologies occupations</p> <p>Products, services and/or environments are designed to meet community needs, including consideration of sustainable factors</p> <p><b>Design thinking skills</b></p> <p><b>Project management</b><br/>Use agreed protocols and management roles to communicate ideas, plan and make decisions, to develop solutions</p> | <p><b>Learning intention</b><br/>To understand the range of materials and properties of modern versus vintage playgrounds, and the reasons behind the changes over time.</p> <p><b>Focus questions</b></p> <ul style="list-style-type: none"> <li>• What components make up this playground?</li> <li>• What materials are used in the construction of the playground?</li> <li>• What safety considerations have been implemented in the playground?</li> <li>• What are the main similarities and differences between a vintage playground and a modern playground?</li> <li>• Why have the design and construction of playgrounds changed over time?</li> </ul> <p><b>Support notes</b><br/>Components of a playground include equipment, such as slides, monkey bars, swings, climbing frame, shelter.</p> <p>Safety considerations in a playground design include shelter, choice of materials, height of components, safety rails, flooring under and around the playground and fencing around the playground. Designers would also consider the age of children the playground is targeted towards when considering safety.</p> <p>Visiting a modern playground may be considered.</p> | <p><b>Introduction</b></p> <ul style="list-style-type: none"> <li>• Select and display a photo of a vintage playground. Use the first three focus questions to guide a discussion about the vintage playground.</li> <li>• Select and display a photo of a modern playground and discuss using the same focus questions.</li> <li>• Assign students into groups of four and give each group a photo of a vintage playground and a modern playground (Appendix A.2).</li> </ul> <p><b>Learning activity</b></p> <ul style="list-style-type: none"> <li>• Students work in a small group to complete a Venn diagram comparing a vintage playground to a modern playground. Guide students to consider the function, materials and sustainability factors.</li> </ul> <p><b>Conclusion</b></p> <ul style="list-style-type: none"> <li>• Discuss student findings using the fourth focus question.</li> <li>• Brainstorm responses to the last focus question with the students.</li> </ul> |



| Western Australian Curriculum content | Teaching and learning intentions  | Learning experiences |
|---------------------------------------|---|----------------------|
|                                       | <p>Playgrounds have changed over time due to a number of reasons, including:</p> <ul style="list-style-type: none"><li>• increase in safety considerations (height of equipment, incline of slide, safety rails)</li><li>• less metal used reduces the surface temperature of equipment</li><li>• sustainability of materials used.</li></ul> <p>The search term 'vintage playground' or a historic decade, such as '1970s playground', will provide images. It may be useful to search for vintage images of your local area, for the students to have context and a connection with the images.</p> <p><b>Suggested assessment points</b><br/>Use students' Venn diagrams to assess their understanding of the materials and function of various playgrounds over time, considering community needs and sustainability factors.</p> |                      |

## Term 3 Week 2: Playground review

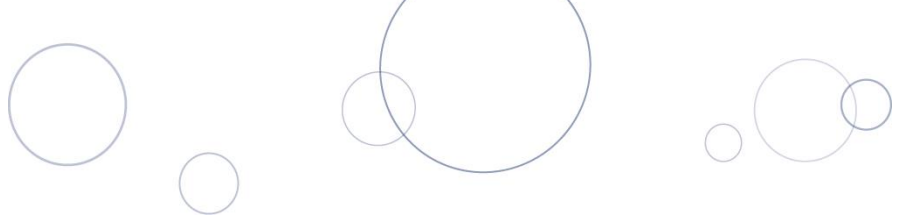
| Western Australian Curriculum content  | Teaching and learning intentions  | Learning experiences  |
|--|---|---|
| <p><b>Technologies and society</b><br/>Diverse roles for people in design and technologies occupations</p> <p><b>Design thinking skills</b></p> <p><b>Project management</b><br/>Use agreed protocols and management roles to communicate ideas, plan and make decisions, to develop solutions</p> | <p><b>Learning intention</b><br/>To compare the design differences and construction considerations in playgrounds for junior and senior students.</p> <p><b>Focus questions</b></p> <ul style="list-style-type: none"> <li>• Which components does the senior playground have?</li> <li>• Which components does the junior playground have?</li> <li>• What is similar between the junior playground and the senior playground?</li> <li>• What is different between the junior playground and senior playground?</li> <li>• What machinery is used in the construction of playground equipment?</li> <li>• What safety practices can you notice in the use of machinery?</li> </ul> <p><b>Support notes</b><br/>Safety practices required when using machinery to construct a playground include wearing gloves, face shields, goggles, boots, full body suits.</p> <p>Refer to Appendix A.2 for a suggested list of videos on how playgrounds are made.</p> | <p><b>Introduction</b></p> <ul style="list-style-type: none"> <li>• Briefly review the similarities and differences between vintage playgrounds and modern playgrounds.</li> <li>• Outline the task of comparing junior and senior playgrounds and address behavioural expectations as students move around outside.</li> </ul> <p><b>Learning activity</b></p> <ul style="list-style-type: none"> <li>• Students walk around both the junior and senior playgrounds within the school and list the components of each one. On return to the classroom, students outline the similarities and differences between both playgrounds and share their findings.</li> <li>• Select and show students a video on how playgrounds are made. Note the machinery used, any safe practices implemented in using the machinery and the different roles of people in the construction process.</li> </ul> <p><b>Conclusion</b></p> <ul style="list-style-type: none"> <li>• After watching the video, students make notes on machinery used, the construction process and any key features in the playground design they watched.</li> </ul> |

## Term 3 Week 3: Playground modifications

| Western Australian Curriculum content  | Teaching and learning intentions   | Learning experiences  |
|--|--|---|
| <p><b>Technologies and society</b><br/>Products, services and/or environments are designed to meet community needs, including consideration of sustainable factors</p> <p><b>Design thinking skills</b></p> <p><b>Project management</b><br/>Use agreed protocols and management roles to communicate ideas, plan and make decisions, to develop solutions</p> <p><b>Producing and implementing</b><br/>Use appropriate technologies, components and/or equipment and follow agreed protocols to produce a designed solution</p> | <p><b>Learning intention</b><br/>To label images of senior school playgrounds to improve their suitability for younger students.</p> <p><b>Focus questions</b></p> <ul style="list-style-type: none"> <li>• Which components of this playground are not suitable for a Kindy or Pre-primary student?</li> <li>• How would you change the components to suit a Kindy or Pre-primary student?</li> <li>• Why would you change those components?</li> </ul> <p><b>Support notes</b><br/>When labelling the images, students circle and number each component to change on each image. They then list how they would change each numbered component and the reason for the change. For instance, changing the incline and length of a slide to reduce speed.</p> <p>The search term ‘playgrounds for older children’ will bring up images of senior playgrounds. Alternatively, use photos of the school’s senior playground and photos of other schools’ senior playgrounds. Ensure that no students appear in the photos.</p> <p><b>Suggested assessment points</b><br/>Use the annotated images from the students to assess their understanding of the changes that would be required to alter the target age group for the playground. Take note of the language used in annotations to describe their knowledge of the construction and materials used in the playground.</p> | <p><b>Introduction</b></p> <ul style="list-style-type: none"> <li>• Display a photo of a senior playground. Discuss the components and determine suitability for younger students.</li> <li>• With students, identify any components you would modify to change the playground into one suitable for early childhood students.</li> </ul> <p><b>Learning activity</b></p> <ul style="list-style-type: none"> <li>• In pairs, students examine at least three photos of senior playgrounds and annotate changes to make the playground suitable for early childhood students. Ensure each playground photo has differing components from the other photos.</li> </ul> <p><b>Conclusion</b></p> <ul style="list-style-type: none"> <li>• Use a cooperative learning strategy to share with another pair.</li> </ul> |

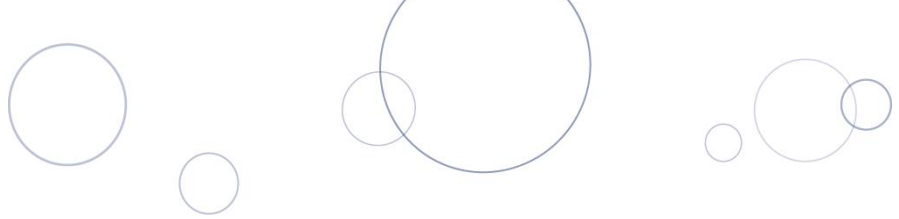
## Term 3 Week 4: Playground model design

| Western Australian Curriculum content  | Teaching and learning intentions  | Learning experiences   |
|--|---|--|
| <p><b>Design thinking skills</b></p> <p><b>Project management</b><br/>Use agreed protocols and management roles to communicate ideas, plan and make decisions, to develop solutions</p> <p><b>Designing</b><br/>Design solutions through use of labelled drawings, technical terms, decision-making and/or a sequence of steps</p> | <p><b>Learning intention</b><br/>To design and label a playground suitable for junior students.</p> <p><b>Focus questions</b></p> <ul style="list-style-type: none"> <li>• What components might you find in a junior playground?</li> <li>• What materials will you use to build the junior playground model?</li> <li>• What equipment and tools will you use to join the model together?</li> </ul> <p><b>Support notes</b><br/>Show students materials that are available in to use when building the model playground. This may include materials such as pop sticks, glue and sticky tape.</p> <p>When making a list of materials to use in building the junior playground model, include where the materials will be sourced from and who will be bringing materials from home, if any.</p> <p>Materials must be sourced and brought into class for Week 5 when the students begin construction.</p> <p><b>Suggested assessment points</b><br/>Observe students' collaborative skills in agreeing to a design.</p> | <p><b>Introduction</b></p> <ul style="list-style-type: none"> <li>• Brainstorm with students the components that could be included in a junior playground. If appropriate, have students survey younger children to determine preferred playground components.</li> <li>• Review the different design features for junior and senior playgrounds, and the reason for the differences.</li> <li>• Display an image of the school's junior playground. Label the components of the playground and highlight what makes them suitable for young children.</li> </ul> <p><b>Learning activity</b></p> <ul style="list-style-type: none"> <li>• Individually, students design and sketch a junior playground and label the components.</li> <li>• Outline the design task of constructing their designed model of a junior playground.</li> <li>• Assign students to groups of three or four or let them form their own groups.</li> <li>• Students collaborate with their group to decide a design/s to build a model junior primary playground. If the design is a combination of designs, collaboratively sketch a diagram with labelled components.</li> <li>• In their groups, students list the materials they will use to build the model playground and the tools used to join the materials together.</li> </ul> <p><b>Conclusion</b></p> <ul style="list-style-type: none"> <li>• Groups share their sketches and material ideas with the class.</li> </ul> |



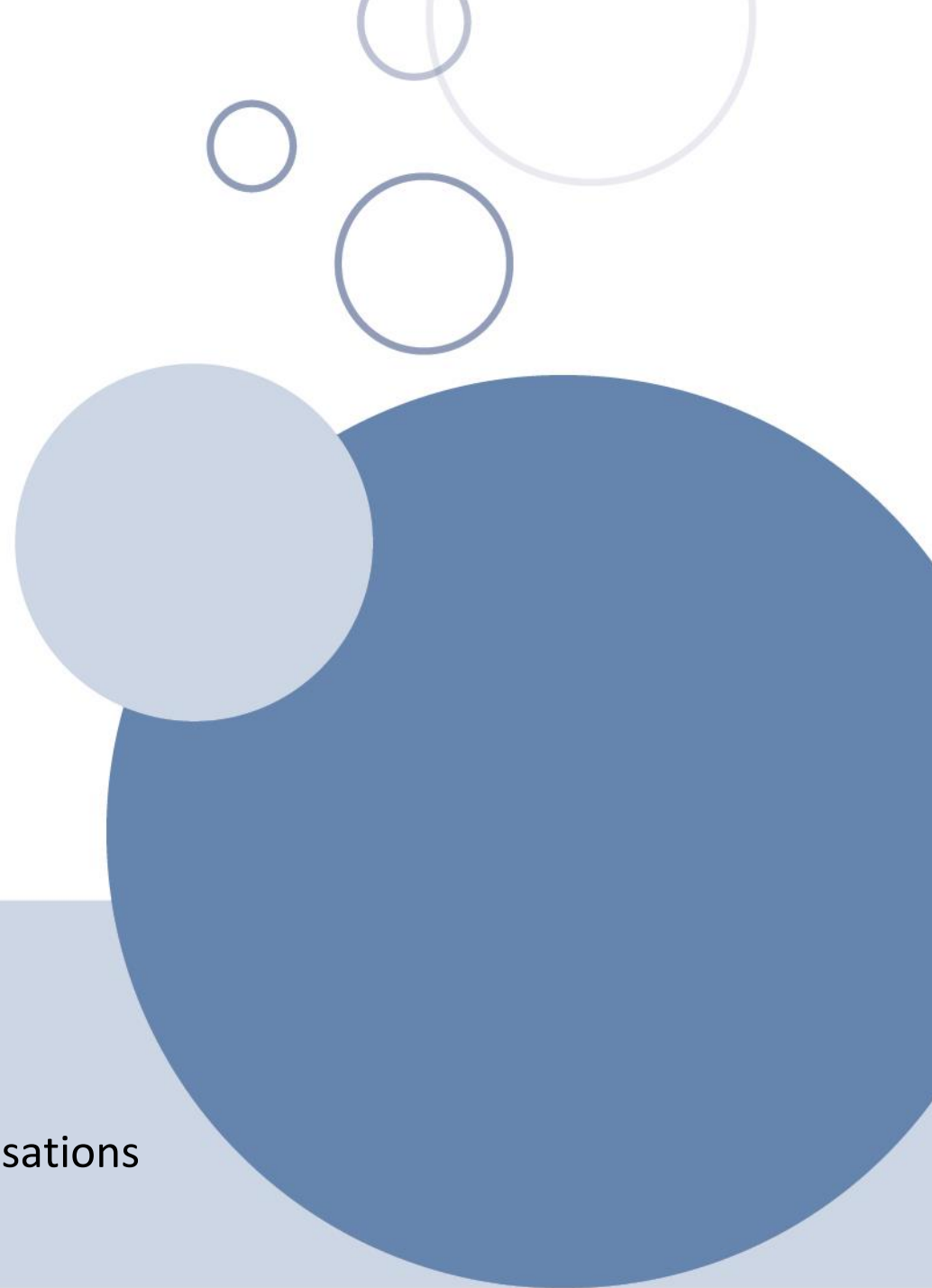
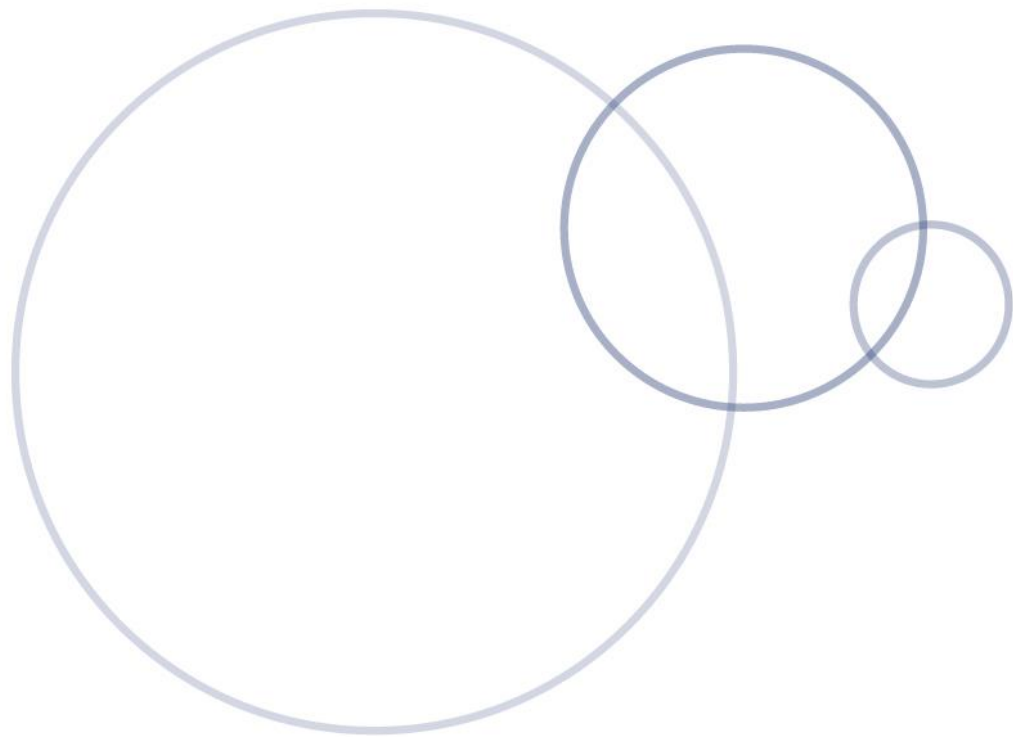
## Term 3 Weeks 5–7: Playground model construction

| Western Australian Curriculum content  | Teaching and learning intentions   | Learning experiences   |
|--|--|--|
| <p><b>Technologies and society</b><br/>Diverse roles for people in design and technologies occupations</p> <p><b>Design thinking skills</b></p> <p><b>Project management</b><br/>Use agreed protocols and management roles to communicate ideas, plan and make decisions, to develop solutions</p> <p><b>Producing and implementing</b><br/>Use appropriate technologies, components and/or equipment and follow agreed protocols to produce a designed solution</p> | <p><b>Learning intention</b><br/>To work collaboratively in the construction of a model playground suitable for junior students.</p> <p><b>Focus questions</b></p> <ul style="list-style-type: none"> <li>• What safe practices will you implement?</li> <li>• What role will each group member undertake within the construction process?</li> </ul> <p><b>Support notes</b><br/>Design task-specific safe practices, such as when using scissors to cut the materials and the use of PVA when joining materials.<br/><br/>Demonstrate collaborative construction skills by allocating each group member a part of the playground to prepare and build.</p> <p><b>Suggested assessment points</b><br/>Observe the collaborative involvement of each group member in construction.</p> | <p><b>Introduction</b></p> <ul style="list-style-type: none"> <li>• Discuss safe practices for using materials and when joining them together.</li> <li>• Identify the class-specific safe practices for the design task as well as the expectations of all group members actively engaging in the construction of the model playground.</li> <li>• Review ideas from the video students watched in Week 2 showing how different people carried out different functions in the construction process.</li> </ul> <p><b>Learning activity</b></p> <ul style="list-style-type: none"> <li>• In their groups, students collaboratively construct their agreed-on design.</li> </ul> <p><b>Conclusion</b></p> <ul style="list-style-type: none"> <li>• Students go on a ‘gallery-walk’ to have a look at the playground models in progress. Discuss any innovations you’ve noticed, or common challenges and have students discuss their solutions to these.</li> </ul> |



## Term 3 Week 8: Playground evaluation

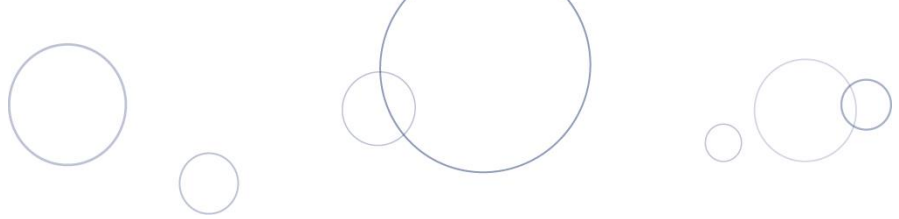
| Western Australian Curriculum content  | Teaching and learning intentions   | Learning experiences   |
|--|--|--|
| <p><b>Technologies and society</b><br/>Products, services and/or environments are designed to meet community needs, including consideration of sustainable factors</p> <p><b>Design thinking skills</b></p> <p><b>Evaluating</b><br/>Use given criteria to evaluate design features, selected resources, decision-making processes and the designed solution</p> | <p><b>Learning intention</b><br/>To evaluate the success of the design and construction of a model junior playground.</p> <p><b>Focus questions</b></p> <ul style="list-style-type: none"> <li>• What adjustments would you make based on your evaluation? Why?</li> <li>• What was the most difficult part of building the model playground?</li> <li>• How do you feel your team worked together?</li> <li>• Why are playgrounds designed for different age groups?</li> </ul> <p><b>Support notes</b><br/>Design criteria could include the suitability of components for a junior primary playground, ease of construction, suitability and safe practice of materials used and collaborative skills. The criteria should only include features which have been covered in previous learning experiences.</p> <p><b>Suggested assessment points</b><br/>Evidence of student learning could be collected through the design sketches, photos of design and evaluations.</p> | <p><b>Introduction</b></p> <ul style="list-style-type: none"> <li>• Discuss the design criteria based on learning undertaken throughout the term. Base the criteria for reflection on the learning intentions and focus questions from each session.</li> </ul> <p><b>Learning activity</b></p> <ul style="list-style-type: none"> <li>• Students independently evaluate their playground model against the design criteria. If possible, invite younger children previously surveyed to provide their feedback.</li> <li>• Students identify any adjustments they will make to their model and outline why they would make those adjustments.</li> <li>• Students reflect on how their team worked together.</li> </ul> <p><b>Conclusion</b></p> <ul style="list-style-type: none"> <li>• Display the completed models and invite other classes or parents to view the completed work.</li> </ul> |



## **Term 4**

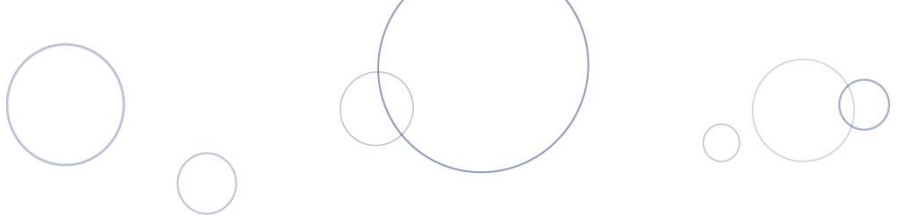
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Weeks 1–8: Materials and technologies specialisations



## Term 4 Week 1: Toys from the past

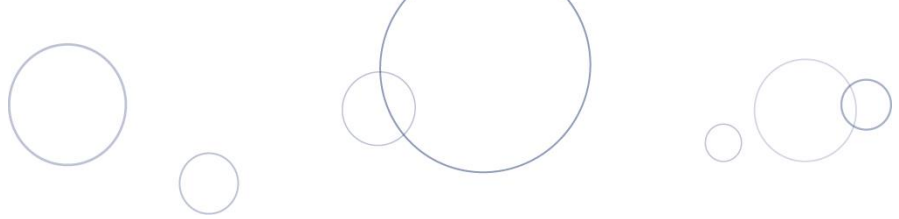
| Western Australian Curriculum content   | Teaching and learning intentions  | Learning experiences  |
|---|---|---|
| <p><b>Contexts</b></p> <p><b>Materials and technologies specialisations</b><br/>Properties of materials and components for a range of purposes affect suitability and function in a system</p> <p><b>Design thinking skills</b></p> <p><b>Project management</b><br/>Use agreed protocols and management roles to communicate ideas, plan and make decisions, to develop solutions</p> <p><b>Designing</b><br/>Design solutions through use of labelled drawings, technical terms, decision-making and/or a sequence of steps</p> | <p><b>Learning intention</b><br/>To explore the features of children’s toys from the past, understand how they’re made and for what purpose.</p> <p><b>Focus questions</b></p> <ul style="list-style-type: none"> <li>• What are the components (parts) of the toy?</li> <li>• How are the components joined together?</li> <li>• What materials are the toy made from?</li> <li>• What is the purpose of the toy?</li> <li>• For which age range is the toy designed?</li> <li>• Is there an equivalent toy in today’s era?</li> </ul> <p><b>Support notes</b><br/>The next three weeks provide the background knowledge for students to complete the summative assessment task <i>Recycled toys</i> (Appendix C).</p> <p>Students will examine the components (parts), materials and purposes of toys from the past. Ask why they were designed and what they do. They will compare these design features to modern toys in Week 2, using a retrieval chart.</p> <p>As an alternative to the video, real toys from the past could be used if they are accessible.</p> | <p><b>Introduction</b></p> <ul style="list-style-type: none"> <li>• Select and show a video about toys from the past. Pause the video to consider one of the toys and use the focus questions to guide a class discussion.</li> <li>• Assign students into small groups or pairs and provide each group with a photo of a toy from the past.</li> </ul> <p><b>Learning activity</b></p> <ul style="list-style-type: none"> <li>• In groups, students use the focus questions to examine the design features of their toy, including labelling the components, materials and joining of the toy.</li> <li>• Use a comparison chart, such as a retrieval chart, to organise information.</li> </ul> <p><b>Conclusion</b></p> <ul style="list-style-type: none"> <li>• Select a speaker to share their findings with the class.</li> </ul> |



| Western Australian Curriculum content | Teaching and learning intentions  | Learning experiences |
|---------------------------------------|---|----------------------|
|                                       | <p>See Appendix A.3 for a suggested list of videos about toys from the past.</p> <p>The search phrase 'toys from the past' or searching a decade of toys, for instance '1950's toys', will bring up images of toys.</p> |                      |

## Term 4 Week 2: Modern toys

| Western Australian Curriculum content   | Teaching and learning intentions  | Learning experiences  |
|---|---|---|
| <p><b>Contexts</b></p> <p><b>Materials and technologies specialisations</b><br/>Properties of materials and components for a range of purposes affect suitability and function in a system</p> <p><b>Technologies and society</b><br/>Products, services and/or environments are designed to meet community needs, including consideration of sustainable factors</p> <p><b>Design thinking skills</b></p> <p><b>Designing</b><br/>Design solutions through use of labelled drawings, technical terms, decision-making and/or a sequence of steps</p> | <p><b>Learning intention</b><br/>To explore and label the design features of a modern children’s toy.</p> <p><b>Focus questions</b></p> <ul style="list-style-type: none"> <li>• Which toys would be suitable for 5- or 6-year-olds?</li> <li>• Which toys would be suitable for 9- or 10-year-olds?</li> <li>• What are the components (parts) of the toy?</li> <li>• How are the components joined together?</li> <li>• What materials are the toy made from?</li> <li>• Why were these materials selected?</li> <li>• What is the purpose of the toy?</li> <li>• What are the main differences and similarities between modern toys and toys from the past?</li> </ul> <p><b>Support notes</b></p> <p>The range of toys needs to include toys suitable for younger children as well as older children. Include soft toys in the range. As an alternative, images could be used.</p> <p>The complexity of toys increases according to the age range they have been designed for.</p> <p>Students will bring in a favourite toy, from now or when they were younger, for Week 3.</p> | <p><b>Introduction</b></p> <ul style="list-style-type: none"> <li>• Show a small range of toys suitable for children aged 5 to 12 years old. Ask the first two focus questions and invite responses and reasons why.</li> <li>• Use the same groups from Week 1 and provide each group with a toy.</li> </ul> <p><b>Learning activity</b></p> <ul style="list-style-type: none"> <li>• In groups, students use focus questions three to eight to examine the design features of their toy, including sketching a design and labelling the components, materials and joining of the toy.</li> <li>• Organise information into the retrieval chart from Week 1.</li> </ul> <p><b>Conclusion</b></p> <ul style="list-style-type: none"> <li>• Discuss findings as a class using the last three focus questions.</li> </ul> |

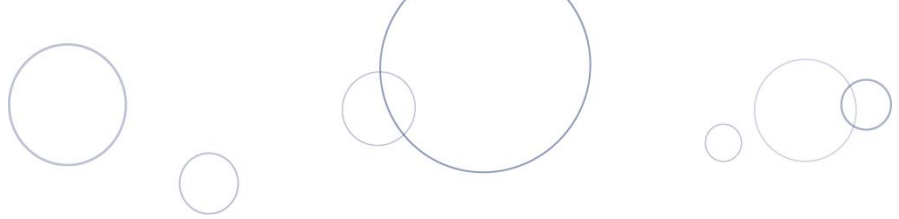


## Term 4 Week 3: Toy design features

| Western Australian Curriculum content  | Teaching and learning intentions  | Learning experiences  |
|--|---|---|
| <p><b>Contexts</b></p> <p><b>Materials and technologies specialisations</b><br/>Properties of materials and components for a range of purposes affect suitability and function in a system</p> <p><b>Technologies and society</b><br/>Products, services and/or environments are designed to meet community needs, including consideration of sustainable factors</p> <p><b>Design thinking skills</b></p> <p><b>Designing</b><br/>Design solutions through use of labelled drawings, technical terms, decision-making and/or a sequence of steps</p> <p><b>Evaluating</b><br/>Use given criteria to evaluate design features, selected resources, decision-making processes and the designed solution</p> | <p><b>Learning intention</b><br/>To determine the design features of toys for young children.</p> <p><b>Focus questions</b></p> <ul style="list-style-type: none"> <li>• What are the components of the toys?</li> <li>• What materials is the toy made from?</li> <li>• What enjoyment/learning would be gained from the toys?</li> </ul> <p><b>Support notes</b><br/>It is suggested that teachers schedule the visit to a Pre-primary classroom for a time when the classroom is not occupied.</p> | <p><b>Introduction</b></p> <ul style="list-style-type: none"> <li>• Review the design features of toys for young children explored in the previous learning experience.</li> <li>• Provide opportunity for the students to visit a Pre-primary classroom (when the children are not there). Students will observe the toys in the room to create a list.</li> </ul> <p><b>Learning activity</b></p> <ul style="list-style-type: none"> <li>• Individually or in pairs, students photograph or make a list of all the toys identified in the Pre-primary classroom.</li> <li>• On return to the class, discuss the toys identified in the Pre-primary classroom. Students categorise the toys in different ways; for example:             <ul style="list-style-type: none"> <li>▪ moveable parts/how the toy moves</li> <li>▪ toys designed for indoor and/or outdoor play</li> <li>▪ makes noise</li> <li>▪ materials from which the toy is made.</li> </ul> </li> </ul> <p><b>Conclusion</b></p> <ul style="list-style-type: none"> <li>• As a class, make a list of the design features common to toys designed for young children. Discuss the purpose of the toys, materials used and sustainability factors.</li> </ul> |

## Term 4 Weeks 4–8: Toy design

| Western Australian Curriculum content   | Teaching and learning intentions  | Learning experiences   |
|---|---|--|
| <p><b>Contexts</b></p> <p><b>Materials and technologies specialisations</b><br/>Properties of materials and components for a range of purposes affect suitability and function in a system</p> <p><b>Technologies and society</b><br/>Products, services and/or environments are designed to meet community needs, including consideration of sustainable factors</p> <p><b>Design thinking skills</b></p> <p><b>Investigating and defining</b><br/>Define the features of a design brief and the requirements of a design task for a community need</p> <p><b>Designing</b><br/>Design solutions through use of labelled drawings, technical terms, decision-making and/or a sequence of steps</p> <p><b>Producing and implementing</b><br/>Use appropriate technologies, components and/or equipment and follow agreed protocols to produce a designed solution</p> | <p><b>Learning intention</b><br/>To design and create a toy appropriate for Pre-primary aged students.</p> <p><b>Focus questions</b></p> <ul style="list-style-type: none"> <li>• What type of toy would be appropriate for a Pre-primary student?</li> <li>• What materials are available for use in the creation of this toy?</li> <li>• Why is using recycled materials a positive environmental choice?</li> </ul> <p><b>Support notes</b><br/>Provide students with a selection of materials to play with and manipulate in preparation for selecting suitable materials for the task.</p> <p><b>Suggested assessment point</b><br/>Students will research toys and make a toy using recycled materials that is suitable for a child in Pre-primary.</p> | <p><b>Assessment task – <i>Recycled toys</i></b></p> <ul style="list-style-type: none"> <li>• Instructions, plans and a marking key can be found in Appendix C.</li> </ul> |



| Western Australian Curriculum content  | Teaching and learning intentions | Learning experiences |
|--|----------------------------------|----------------------|
| <b>Evaluating</b><br>Use given criteria to evaluate design features, selected resources, decision-making processes and the designed solution |                                  |                      |





# Appendix A

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Resources

## Appendix A.1: Resources – Term 1

| Week | Resource  | Link/information  |
|------|---|---|
| 1    | Swings, Slides and Science: Physics for Kids    | <ul style="list-style-type: none"> <li>SciShow Kids – Swings, Slides and Science<br/><a href="https://www.youtube.com/watch?v=JvSClZ3vHOI">https://www.youtube.com/watch?v=JvSClZ3vHOI</a></li> </ul>   |
|      | A force is a push or pull                       | <ul style="list-style-type: none"> <li>funsciencedemos – A Force is a Push or Pull<br/><a href="https://www.youtube.com/watch?v=LdcxCdB-s8">https://www.youtube.com/watch?v=LdcxCdB-s8</a></li> </ul>   |
|      | What is a Force?                                | <ul style="list-style-type: none"> <li>NovelLearningCentre – What Is a Force<br/><a href="https://www.youtube.com/watch?v=uoKo3DbfYZk">https://www.youtube.com/watch?v=uoKo3DbfYZk</a></li> </ul>   |
| 2    | The Simple Machines Song                        | <ul style="list-style-type: none"> <li>Scratch Garden –The Simple Machines Song<br/><a href="https://www.youtube.com/watch?v=iQu3GY509ZM">https://www.youtube.com/watch?v=iQu3GY509ZM</a></li> </ul>  |
|      | Six Simple Machines Rap                         | <ul style="list-style-type: none"> <li>Jack Hartmann Kids Music Channel – Six Simple Machines Rap<br/><a href="https://www.youtube.com/watch?v=NTCTogZ_3Q">https://www.youtube.com/watch?v=NTCTogZ_3Q</a></li> </ul>  |
|      | The Types of Simple Machines Found in Your Home | <ul style="list-style-type: none"> <li>Sciencing – The Types of Simple Machines Found in Your Home<br/><a href="https://sciencing.com/types-simple-machines-found-home-6387889.html">https://sciencing.com/types-simple-machines-found-home-6387889.html</a></li> </ul> |
| 3–4  | Engineering Kids – Rube Goldberg Machine        | <ul style="list-style-type: none"> <li>Tinkerlab – Engineering Kids   Rube Goldberg Machine<br/><a href="https://tinkerlab.com/engineering-kids-rube-goldberg-machine/">https://tinkerlab.com/engineering-kids-rube-goldberg-machine/</a></li> </ul>                    |
|      | Music video of Rube Goldberg machine            | <ul style="list-style-type: none"> <li>OK Go – This Too Shall Pass   Rube Goldberg Machine   Official Music Video<br/><a href="https://www.youtube.com/watch?v=qybUFnY7Y8w">https://www.youtube.com/watch?v=qybUFnY7Y8w</a></li> </ul>                                  |
|      | Kid’s homemade Rube Goldberg machine            | <ul style="list-style-type: none"> <li>Littlepythagoras – Audri’s Rube Goldberg Monster Trap<br/><a href="https://www.youtube.com/watch?v=0uDDEEHdf1Y">https://www.youtube.com/watch?v=0uDDEEHdf1Y</a></li> </ul>   |

## Appendix A.2: Resources – Term 3

| Week | Resource                             | Link/information   |
|------|--------------------------------------|--|
| 1    | History of Playgrounds               | <ul style="list-style-type: none"><li>Miracle Recreation – History of Playground Equipment<br/><a href="https://www.miracle-recreation.com/blog/history-of-playground-equipment/?lang=can">https://www.miracle-recreation.com/blog/history-of-playground-equipment/?lang=can</a></li></ul> |
| 2    | How It's Made – Playground Equipment | <ul style="list-style-type: none"><li>Panos Egglezos – How It's Made   Playground Equipment<br/><a href="https://www.youtube.com/watch?v=4y0d6JarNF8">https://www.youtube.com/watch?v=4y0d6JarNF8</a></li></ul>  |

### Appendix A.3: Resources – Term 4

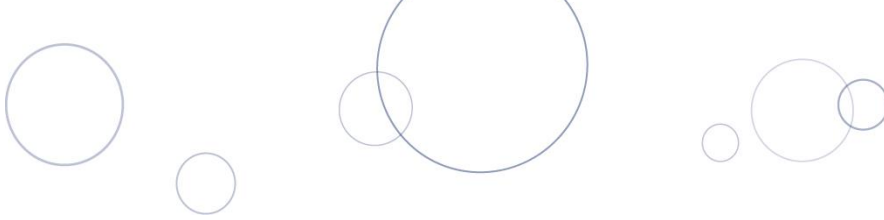
| Week | Resource                    | Link/information   |
|------|-----------------------------|--|
| 1    | 100 Years of Toys           | <ul style="list-style-type: none"><li>Glam, Inc – 100 Years of Toys ★ Glam.com<br/><a href="https://www.youtube.com/watch?v=EDAPaEVr1Hk">https://www.youtube.com/watch?v=EDAPaEVr1Hk</a></li></ul> |
|      | Kids Try Toys From The Past | <ul style="list-style-type: none"><li>SunLife – Kids Try Toys from the Past<br/><a href="https://www.youtube.com/watch?v=syVHRJ-qKb4">https://www.youtube.com/watch?v=syVHRJ-qKb4</a></li></ul>    |



## **Appendix B**

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Assessment task 1  
Rubber band racer



## Task details

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|                              |   |
|------------------------------|---|
| <b>Title</b>                 | Rubber band racer   |
| <b>Description</b>           | Build a rubber band racer using provided resources  |
| <b>Type of assessment</b>    | Summative   |
| <b>Purpose of assessment</b> | To assess students' understanding and application of how the types of materials used and type of force applied will impact on the speed of a racing car   |
| <b>Ways of assessing</b>     | Design sheet with photos  |
| <b>Suggested time</b>        | Three hours   |
| <b>Differentiation</b>       | Teachers should differentiate their teaching and assessment to meet the specific learning needs of their students, based on their level of readiness to learn and their need to be challenged. Where appropriate, teachers may either scaffold or extend the scope of the assessment tasks. |

## Content descriptions

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### Contexts

#### Engineering principles and systems

- Forces, and the properties of materials affect the behaviour of an object or system

#### Design thinking skills

##### Project management

- Use agreed protocols and management roles to communicate ideas, plan and make decisions, to develop solutions

##### Investigating and defining

- Investigate and select resources based on properties for the given task

##### Designing

- Design solutions through use of labelled drawings, technical terms, decision-making and/or a sequence of steps

##### Producing and implementing

- Use appropriate technologies, components and/or equipment and follow agreed protocols to produce a designed solution

##### Evaluating

- Use given criteria to evaluate design features, selected resources, decision-making processes and the designed solution



## Task preparation

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### Prior learning

Students have carried out the processes and production skills in previous lessons.

Students have examined forces and properties of materials.

### Resources

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- Internet to research rubber band-powered cars
- Materials to build rubber band racers – cardboard, circular recycled materials for wheels (lids, CD-ROMs), rubber bands, tape, glue

### Instructions for students

Students work in groups to build a rubber band racer and investigate rubber band-powered cars.

Students independently make adjustments to the group design.



## Instructions for teacher

### Task instructions

1. Instruct children to work in small groups and build a rubber band-powered racer using the resources found on the internet to test how far the racer travels.
2. Students collaboratively research rubber band-racing cars and brainstorm how to improve their design.
3. As a class, develop criteria to evaluate the design of the rubber band racers.
4. Students independently sketch and annotate an improved rubber band racer and then, as a group, select a design or combination of designs to build.
5. List the materials needed to build the new rubber band racer.
6. In groups, students build the improved rubber band racer and test the racer to see how far it travels.
7. Students independently evaluate the rubber band racer design.

Students use the design sheet to:

- include a photo of the first rubber band racer
- identify any adjustments they had to make to the first rubber band racer to make it work
- note what they learned from their research
- independently sketch and label a design of an improved rubber band racer
- collaboratively decide on a design to build
- make a list of the materials needed
- include a photo of the improved rubber band racer as well as any adjustments needed
- use the criteria to evaluate the final design.



## Instructions to students

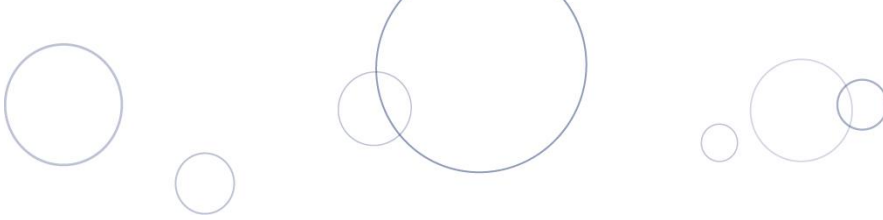
### Group design 1

#### Design sheet

Include a photo of the first rubber band racer made with your group.

It is unlikely that your car worked the first time. What adjustments do you need to make to your car and why? If it did work the first time, why do you think this was so? What adjustments could you make to increase the distance travelled?

How far did your car travel when you finished making the adjustments?

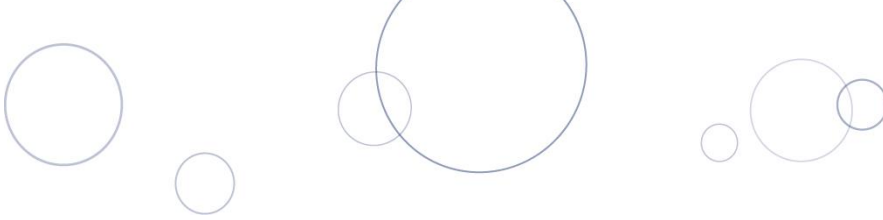


### Group research

Your task is to improve on this design so that your car travels further when the car is pulled back and the rubber band is at 'full wind'.

With your group, research rubber band cars and suggestions for how to make them travel further. Record your findings.

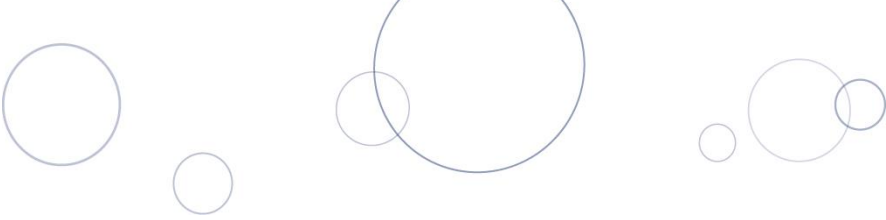
Before you design another car, list the materials you would use and explain why you chose them.



### Individual design

Individually design an improved rubber band car. Label your diagram and include notes to explain how the materials you chose will improve the distance your car travels.

Meet with your group and decide on which design, or combination of designs, to use. Write down the decision you made and why.



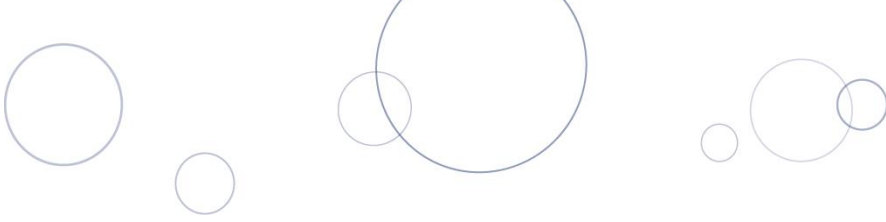
**Group design 2**

Make a list of the materials you will need. The materials should be available in class, or you can bring them from home. Put a name next to who is responsible for bringing the item from home.

| Material | Source | Material | Source |
|----------|--------|----------|--------|
|          |        |          |        |
|          |        |          |        |
|          |        |          |        |
|          |        |          |        |
|          |        |          |        |
|          |        |          |        |
|          |        |          |        |
|          |        |          |        |

Include a photo of your group’s car.





Using the criteria decided as a class, evaluate your group's final car design.

What changes would you make to the car design and why?

## Marking key

| Description  | Marks     |
|--|-----------|
| <b>Understands forces and properties of materials</b>  |           |
| Explains in detail how forces and the properties of materials affect the behaviour of a rubber band car  | 4         |
| Recognises and describes the way forces and the properties of materials affect the behaviour of a rubber band car  | 3         |
| Recognises forces and the properties of materials affect the behaviour of a rubber band car  | 2         |
| Requires guidance to identify the forces and materials which would affect the behaviour of the rubber band car   | 1         |
| <b>Subtotal</b>  | <b>/4</b> |
| <b>Selects appropriate materials</b>   |           |
| Independently selects a variety of appropriate materials to make a car and justifies their choice of materials. Explains safety considerations in detail               | 4         |
| Independently selects materials appropriate to the construction of their car and explains their choice. Explains safety considerations                                 | 3         |
| Selects materials that are appropriate to complete the task. Refers to the choice of materials. Considers the safety aspects and gives a simple explanation            | 2         |
| Requires guidance when selecting materials to make the rubber band racer. Requires assistance to consider safety aspects   | 1         |
| <b>Subtotal</b>  | <b>/4</b> |
| <b>Develops and communicates design ideas and decisions</b>  |           |
| Demonstrates an extensive knowledge and understanding of design and design choice. Uses a range of appropriate technical terms to explain their choices                | 4         |
| Demonstrates a high level of competence when choosing a design which is reflected in the drawing of the car. Uses appropriate technical terms to explain their choices | 3         |
| Demonstrates ability to accurately draw and label a design for a car. Uses some technical terms to explain their choice  | 2         |
| Attempts to draw the design, which may or may not be labelled  | 1         |
| <b>Subtotal</b>  | <b>/4</b> |

| Description  | Marks      |
|--|------------|
| <b>Uses criteria to evaluate and justify simple design processes and solutions</b>   |            |
| Comprehensively acknowledges that the initial design needs to match the end outcome and accurately explains and justifies any alterations                            | 4          |
| Shows understanding that the car must match the design and can clarify any changes made and give reasons for the changes   | 3          |
| Follows the design accurately and understands that the end program should match the initial design. Lists basic changes made   | 2          |
| Provides end product, which may not match the design and no explanation or an attempted explanation is offered, or the explanation isn't relevant to the design task | 1          |
| <b>Subtotal</b>  | <b>/4</b>  |
| <b>Works independently, or collaboratively when required, to plan, safely create and communicate ideas and information for solutions.</b>                            |            |
| Consistently works independently or collaboratively to plan, safely create and effectively communicate logical ideas and information for solutions                   | 3          |
| Often works independently or collaboratively to plan, safely create and effectively communicate logical ideas and information for solutions                          | 2          |
| Requires assistance to collaborate with others and/or work independently   | 1          |
| <b>Subtotal</b>  | <b>/3</b>  |
| <b>Total</b>   | <b>/19</b> |



## **Appendix C**

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Assessment task 2

Recycled toys



## Task details

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|                              |   |
|------------------------------|---|
| <b>Title</b>                 | Recycled toys   |
| <b>Description</b>           | Students will research toys and make a toy using recycled materials that is suitable for a child in Pre-primary   |
| <b>Type of assessment</b>    | Summative   |
| <b>Purpose of assessment</b> | To design and construct an age-appropriate toy using recycled materials for a Pre-primary student   |
| <b>Ways of assessing</b>     | Design<br>Student evaluation<br>Final product   |
| <b>Suggested time</b>        | Five hours  |
| <b>Differentiation</b>       | Teachers should differentiate their teaching and assessment to meet the specific learning needs of their students, based on their level of readiness to learn and their need to be challenged. Where appropriate, teachers may either scaffold or extend the scope of the assessment tasks. |

## Content descriptions

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### Contexts

#### Materials and technologies specialisations

- Properties of materials and components for a range of purposes affect suitability and function in a system

#### Technologies and society

- Products, services and/or environments are designed to meet community needs, including consideration of sustainable factors

#### Design thinking skills

##### Investigating and defining

- Define the features of a design brief and the requirements of a design task for a community need

##### Designing

- Design solutions through use of labelled drawings, technical terms, decision-making and/or a sequence of steps

##### Evaluating

- Use given criteria to evaluate design features, selected resources, decision-making processes and the designed solution



## Task preparation

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### Prior learning

Students have an understanding of toys which are age-appropriate, and a connection with Pre-primary students (within the school or external to school). If possible, a prior visit to the Pre-primary classrooms may help students to gain perspective on the needs of this community.

Students understand how to evaluate their process and end product using the given criteria.

### Resources

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- View various websites giving examples of recycled toys that are age-appropriate
- Recycled materials, for example, cloths, plastic bottles, bottle lids



## Instructions for teacher

As a whole class, research different types of toys and the materials they are made of. Discuss the materials and why they are appropriate for their chosen toy, e.g. teddies are made from cloth so they are soft, rocking horses are made from wood so they are strong and can be sat on, etc.

Brainstorm a list of possible recycled materials that could be used to construct their toys. Consider availability, safety and ease of use – can they use the materials in class to make their toy?

### Examples of materials:

- old cloths (for use as materials to make dolls, teddies, etc.)
- plastic bottles and lids (to make vehicles, robots, etc.)
- shells, coat hangers (to make mobiles)

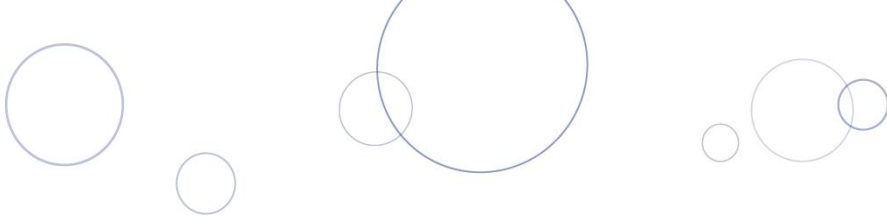
### Task instructions

Students use the design sheet to draw and label a detailed design of their toy

- Include a list of recycled materials they think they are going to need/use
- Write a sequence of steps to make the toy
- Make the toy
- Take a photo of the toy
- Complete the evaluation sheet
  - Before doing this, students may give the completed toy to the intended recipient to get feedback from them. This may include strength, engagement of the recipient, etc.
- List any possible adjustments and sketch a labelled diagram based on the evaluation

### Any worksheets or scaffolding specific to the task

- Design sheet
  - drawn design that is labelled
  - materials listed and explanation of choice of materials
  - sequence of steps
- Evaluation sheet
- Adjustments



## Instructions to students

Draw your toy design and label it in detail, including how you will use the materials to make each part of the toy.

Include a list of the materials you will use.

| List the materials you will use | Reason why the material was chosen |
|---------------------------------|------------------------------------|
|                                 |                                    |
|                                 |                                    |
|                                 |                                    |
|                                 |                                    |
|                                 |                                    |
|                                 |                                    |



Explain why you chose to make this toy. Comment on who it is for, their age, what they like/dislike, etc.

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**Production process**

Develop a plan of how you will create your toy. Include the materials you are using and as much information as possible to assist you.

Write a sequence of steps to produce your toy.

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This toy is for a small child. What safety aspects do you need to consider when creating the toy?

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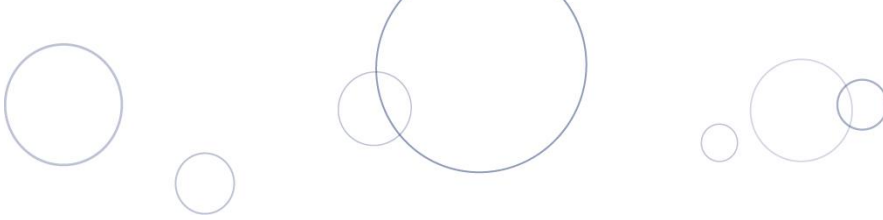
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## Evaluation sheet

| Question   | Yes | No | Comment – reasons for your answers |
|--|-----|----|------------------------------------|
| Did you follow your design when you made your toy?                             |     |    |                                    |
| Did you use the materials you planned to use?                                  |     |    |                                    |
| Was your toy strong?   |     |    |                                    |
| Did your toy meet the needs of you target audience?<br>Explain why or why not. |     |    |                                    |
| What improvements could you make to your toy?                                  |     |    |                                    |
| What safety aspects have you considered?                                       |     |    |                                    |
| Why are these important safety considerations?                                 |     |    |                                    |



What adjustments would you make to the toy if you were to make it again?

Include a labelled sketch of an adjusted design.

## Marking key

| Description   | Marks      |
|---|------------|
| <b>Suitability of toy for a Pre-primary student and explanation of choice of toy and materials</b>  |            |
| Demonstrates a high level of understanding when making a product for a specific audience and explains the recycled materials used         | 3          |
| Demonstrates an understanding of making a product for a specific audience and uses recycled materials                                     | 2          |
| Requires assistance to select a toy to construct and advice on material to use  | 1          |
| <b>Subtotal</b>   | <b>/3</b>  |
| <b>Demonstrates suitability and safe practice, final product and materials used</b>   |            |
| Independently selects materials appropriate to the construction of their toy and explains their choice and safety considerations          | 3          |
| Selects materials to make a toy that are appropriate to complete the task. Refers to the choice of materials and considers safety aspects | 2          |
| Requires guidance when constructing the toy, material selection and safety considerations   | 1          |
| <b>Subtotal</b>   | <b>/3</b>  |
| <b>Draws a labelled diagram and defines a sequence of steps</b>   |            |
| Explores ideas and creates logical, sequenced steps as well as a labelled design to make a recycled toy. Technical terms used correctly   | 3          |
| Creates sequenced steps to design a recycled toy and uses some technical terms on a labelled design                                       | 2          |
| Creates simple incomplete steps to design a recycled toy. Draws a simple design which may not be labelled                                 | 1          |
| <b>Subtotal</b>   | <b>/3</b>  |
| <b>Uses criteria to evaluate and justify simple design processes and solutions</b>  |            |
| Understands that the toy must match the design and can clarify any changes made and give reasons for changes                              | 3          |
| Follows their design accurately and understands the end product should match the initial design. Lists basic changes made                 | 2          |
| End product may not match the design, and no explanation is provided or the explanation is not relevant to the design task                | 1          |
| <b>Subtotal</b>   | <b>/3</b>  |
| <b>Total</b>  | <b>/12</b> |



