



Curriculum resource module

Year 1

Our magnificent thing

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The STEM Learning Project

The aim of the STEM Learning Project is to generate students' interest, enjoyment and engagement with STEM (Science, Technology, Engineering and Mathematics) and to encourage their ongoing participation in STEM both at school and in subsequent careers. The curriculum resources will support teachers to implement and extend the Western Australian Curriculum and develop the general capabilities across Kindergarten to Year 12.

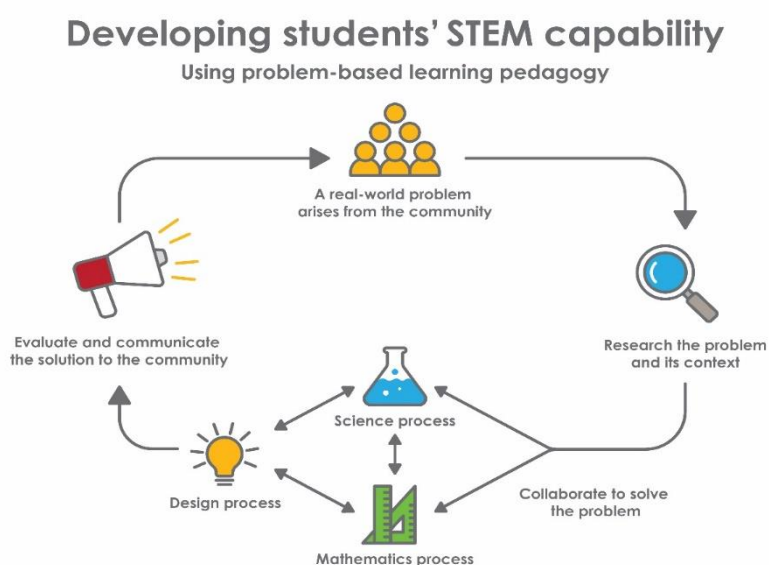
Why STEM?

A quality STEM education will develop the knowledge and intellectual skills to drive the innovation required to address global economic, social and environmental challenges.

STEM capability is the key to navigating the employment landscape changed by globalisation and digital disruption. Routine manual and cognitive jobs are in decline whilst non-routine cognitive jobs are growing strongly in Australia. Seventy-five per cent of the jobs in the emerging economy will require critical and creative thinking and problem solving, supported by skills of collaboration, teamwork and literacy in mathematics, science and technology. This is what we call STEM capability. The vision is to respond to the challenges of today and tomorrow by preparing students for a world that requires multidisciplinary STEM thinking and capability.

The approach

STEM capabilities are developed when students are challenged to solve open-ended, real-world problems that engage students in the processes of the STEM disciplines.



Year 1 – Our magnificent thing

Overview

This module focuses on repurposing rubbish, giving students the opportunity to consider sustainability and the impact of their lifestyle choices on the environment. Based on the fiction picture book, *The Most Magnificent Thing* by Ashley Spires, students are encouraged to repurpose recyclable items to create their own most magnificent thing (something of value to them). Students develop their ability to design, create and problem-solve.

What is the context?

The majority of items we buy are packaged in paper, cardboard, plastic, aluminium or glass. Although packaging comprises valuable resources, it is often thrown away. This waste of natural resources and energy is a threat to sustainability.

What is the problem?

What problem in your life could you solve by building something with reused materials?

How does this module support the integration of the STEM disciplines?

Science

Students explore the properties of familiar materials and make decisions about which will be most useful for constructing their magnificent thing. They consider ways of changing the available materials to suit their needs ([ACSSU018](#) – *Everyday materials can be physically changed in a variety of ways*). Students will explain why they chose to use particular materials and how and why they physically changed the materials.

Students will follow simple procedures to test the properties of the materials available to make their magnificent thing and record their observations. They consider ways of organising their observations and begin to infer cause-and-effect relationships from their observations ([ACSI025](#) – *Participate in guided investigations to explore and answer questions*).

Technologies

Students explore the properties of familiar materials and make decisions about which will be most useful for constructing their magnificent thing. They also justify their choice of materials in constructing their magnificent thing ([ACTDEK004](#) – *Characteristics and behaviours of individual materials used in products*).

Students produce a design that meets their specific needs ([ACTDEK001](#) - *People produce familiar products and services to meet personal and community needs*). They create a diagram of their magnificent thing and can describe their design ideas ([WATPPS07](#) – *Develop and communicate design ideas through describing, drawing, modelling and/or a sequence of written or spoken steps*).

Students document their design process and use digital technologies to share their work ([ACTDIP006](#) – *Share and publish information with known people in an online environment, modelling strategies to stay safe online*).

The [Design process guide](#) is included as a resource to provide assistance to teachers in understanding the complete design process as developed in the technologies syllabus.

Mathematics

Students recognise and classify familiar shapes and objects as they sort and select materials for their magnificent thing construction ([ACMMG022](#) – *Recognise and classify familiar two-dimensional shapes and three-dimensional objects using obvious features*).

Students count the number of shapes or objects and record their observations as a tally or a simple data display with one-to-one correspondence. They describe the data in simple terms. ([ACMSP263](#) - *Represent data with objects and drawings where one object or drawing represents one data value. Describe the displays*).

General capabilities

There are opportunities for the development of general capabilities and cross-curriculum priorities as students engage with *Our magnificent thing*. In this module, students:


- Develop problem solving skills as they research the problem and its context (*Activity 1*); investigate parameters impacting on the problem (*Activity 2*); imagine and develop solutions (*Activity 3*); and evaluate and communicate their solutions to an audience (*Activity 4*).
- Utilise creative thinking as they generate possible design solutions; and critical thinking, numeracy skills and ethical understanding as they choose between alternative approaches to solving the problem of reusing materials to make something of use.
- Utilise personal and social capability as they develop socially cohesive and effective working teams; collaborate in generating solutions; adopt group roles; and reflect on their group work capabilities.

- Utilise a range of literacies and information and communication technology (ICT) capability as they collate records of work completed throughout the module in a class journal and represent and communicate their solutions to an audience using digital technologies in *Activity 4*.
- Communicate and, using evidence, justify their design to an authentic audience.

What are the pedagogical principles of the STEM learning modules?

The STEM Learning Project modules develop STEM capabilities by challenging students to solve real-world problems set in authentic contexts. The problems engage students in the STEM disciplines, provide opportunities for developing higher order thinking and reasoning and the general capabilities of creativity, critical thinking, communication and collaboration.

The design of the modules is based on four pedagogical principles:

- **Problem-based learning**
This is an underlying part of all modules with every module based around solving an initial problem. It is supported through a four-phase instructional model: research the problem and its context; investigate the parameters impacting on the problem; design and develop solutions to the problem; and evaluate and communicate solutions to an authentic audience.
- **Developing higher order thinking**
Opportunities are created for higher order thinking and reasoning through questioning and discourse that elicits students' thinking, prompts and scaffolds explanations and requires students to justify their claims. Opportunities for making reasoning visible through discourse are highlighted in the modules with the icon shown here. 
- **Collaborative learning**
This provides opportunities for students to develop teamwork and leadership skills, challenge each other's ideas, and co-construct explanations and solutions. Information that can support teachers with aspects of collaborative learning is included in the resource sheets.
- **Reflective practice**
Recording observations, ideas and one's reflections on the learning experiences in some form of journal fosters deeper engagement and metacognitive awareness of what is being learned. Information that can support teachers with journaling is included in the resource sheets.

These pedagogical principles can be explored further in the STEM Learning Project online professional learning modules located in Connect Resources.

Activity sequence and purpose

Activity 1



RESEARCH

The text *The Most Magnificent Thing* is shared with students, encouraging them to think creatively about how they can repurpose items to create something of value.

Students sort, count and tally collected items, and represent data using graphs.

What a lot of rubbish

Activity 2



INVESTIGATE

Students investigate the properties and shapes of the items and decide which materials will be useful for building their own most magnificent thing.

Explore properties and shapes

Activity 3



IMAGINE & CREATE

Students draw an annotated design of their own most magnificent thing and explain its role or purpose. They use this design to build their most magnificent thing from reused materials.

Design, draw and create

Activity 4



COMMUNICATE & EVALUATE

Students reflect on the design process and analyse their most magnificent thing. They communicate their designs to an authentic audience through a chosen form of digital media.

Present and explain

Background

Expected learning	<p>Students will be able to:</p> <ol style="list-style-type: none"> 1. Identify types of materials, sort objects by material type and explain why some objects are made of particular materials. 2. Follow simple procedures to test the properties of materials, recording observations in a provided table. 3. Explain how objects can be changed physically and justify why certain materials were used in their construction. 4. Count numbers of objects, record numbers as a tally and represent tallies as a pictograph. 5. Recognise and classify familiar two-dimensional figures and three-dimensional objects. 6. Imagine, design and construct an object for a purpose. 7. Create a labelled drawing and a digital representation of their object.
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Vocabulary	<p>The following vocabulary list contains terms that need to be understood, either before the module commences or developed as they are used.</p> <p>aluminium foil, cans, cardboard, classify, construct, glass, paper, plastic, purposeful, recyclable, recycle, repurpose, reuse, rubbish, sort, strength, sustainability, transparency, useful, water-resistant</p>
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Timing	<p>There is no prescribed duration for this module. The module is designed to be flexible enough for teachers to adapt. Activities do not equate to lessons; one activity may require more than one lesson to implement.</p>
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Consumable materials	<p>A Materials list is provided for this module.</p> <p>This list outlines materials outside of normal classroom equipment that will be needed to complete the activities.</p>
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Safety notes	<p>There are potential hazards inherent in these activities and with the equipment being used, and a plan to mitigate any risks will be required.</p> <p>Potential hazards specific to this module include but are not limited to:</p> <ul style="list-style-type: none"> • Construction tools
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Assessment

The STEM modules have been developed to provide students with learning experiences to solve authentic real-world problems using science, technology, engineering and mathematics capabilities. Appendix 1 indicates how the activities are linked to the Western Australian Curriculum.

While working through the module, the following assessment opportunities will arise:

- Student presentations in *Activity 4* provide an opportunity for assessment with cross curricular links to English – Literacy; Speaking and listening.

Evidence of learning from journaling, presentations and anecdotal notes from this module can contribute towards the larger body of evidence gathered throughout a teaching period and can be used to make on-balance judgements about the quality of learning demonstrated by the students in the Science, Technologies and Mathematics learning areas.

Students can further develop the general capabilities of Information and communication technology (ICT) capability, Critical and creative thinking and Personal and social capability. Continuums for these are included in the [General capabilities continuums](#) but are not intended to be for assessment purposes.

Activity 1: What a lot of rubbish

Activity focus



This activity is designed to encourage students to think creatively about how they can repurpose items to create something of value.

Students read the text *The Most Magnificent Thing* by Ashley Spires; sort, count and tally collected recyclable items; and represent data using graphs.

Background information

Sustainability refers to conserving resources to support long-term ecological balance. In developed countries, marketing has convinced consumers that the things they purchase should be packaged in an attractive manner. Packaging often goes beyond keeping the product hygienic or safe and focuses on making the product attractive. The manufacture of packaging materials consumes resources and energy. When packaging is discarded, the resources are wasted. Sustainability is enhanced when packaging is reduced, reused, repurposed or recycled.

Instructional procedures

Student thinking from the lesson should be recorded as annotations in the class reflective journal, along with copies of photos that have been taken. This could also be recorded through a digital platform, see [Reflective journal](#) for elaboration.

It is recommended that students work in small groups of three to four for the activities. Mixed ability groups encourage peer tutoring and collaboration in problem solving. Collaboration is an important STEM capability. There are many solutions to this problem and negotiation is encouraged. See [Teacher resource sheet 1.1: Cooperative learning – Roles](#).

Throughout these activities, it is important students are involved in creating the tables and graphs used to collect and represent data. When guided to generate their own tables and graphs, opportunities are presented for students to build mathematical reasoning. Whilst this will typically require more time than using a prepared template, it will enable students to wrestle with the concepts, and in doing so, develop a deeper understanding.

Expected learning	Students will be able to: <ol style="list-style-type: none">1. Identify types of materials, sort objects by material type and explain why some objects are made of particular materials (Technologies).2. Count numbers of objects, record numbers as a tally and represent tallies as a pictograph (Mathematics).
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Equipment required **For the class:**

Whiteboard or interactive whiteboard

The Most Magnificent Thing book by Ashley Spires (or access to a video reading of the book).

For the students:

Recyclable items, labels for sorting items, hoops or boxes to sort items into.

Preparation

Organise for recyclable items to be collected prior to starting the module. Students could collect recyclable items at school or bring in clean recyclable waste from home. Allow sufficient time for enough items to be collected.

Teacher resource sheet 1.0: Sample parent letter provides a sample parent letter explaining the STEM activity in which students will be involved and the resources requested for donation.

Have labels, hoops or boxes for sorting items ready before starting. Alternatively, chalk or tape can be used to create section areas on the floor.

Activity parts**Part 1: Story time**

Show the cover of the story *The Most Magnificent Thing* by Ashley Spires (or a similar book) to the class. As a class discuss what the story could be about. When questioning students, practice wait time and use “because” as a prompt to encourage deeper thinking and reasoning. A cooperative strategy such as *Think-pair-share* provides opportunity for all students to share thoughts. See [Teacher resource sheet 1.1: Cooperative learning – Roles](#) and [Teacher resource sheet 1.2: Cooperative learning – Think, Pair, Share](#). A template suggestion to record class thinking is provided [Student activity sheet 1.3: I see, I think, I wonder](#).

I see, I think, I wonder is a visible thinking routine that encourages students to make careful observations and thoughtful interpretations, stimulating curiosity and inquiry.

Read *The Most Magnificent Thing* by Ashley Spires (or a similar book) to the class. Discuss the text and consider questions such as:



- What was the girl's wonderful idea?
- Why did she want to make this?
- What did the girl do before she started building her most magnificent thing? (ie she drew a plan, got an assistant and gathered supplies)
- Where do you think the girl got the supplies to build her most magnificent thing? Could she use different supplies if these weren't available? Such as?
- What if the girl was on a farm? In the bush? At the beach?
- Did the most magnificent thing work out the way the girl planned? Was she happy with it?
- How could the girl make her most magnificent thing bigger or smaller? Stronger? Waterproof? Change colour?
- Was the final product the same as her plan?
- What most magnificent thing could you make?

Record ideas for students to reference in the following activities. Explain to the students they will be designing and building their own magnificent thing as they work through this module.

Part 2: Examine

After reading and discussing the book, look at the collected recyclable items. Ask students to sit in a circle and show them the types of items. List the range of items on the board (eg boxes, bottles, containers and newspapers). Identify the original purpose of the items.



- Do we have more of some items than others?
- Why do you think we have so many or so few of certain items? *Because...*
- Are some items harder to find than others? Which ones? Why?
- What is recycling?
- How can recycling help our environment?
- How does your family recycle?

Practice wait time and use *because* and *why* to encourage higher order thinking and reasoning.

Part 3: Sort

Work together as a class to sort items into groups of the same material. Encourage students to think about why items are made from different materials.



- Why do you think water bottles are made of plastic?
- Why do you think cereal boxes are made of cardboard?
- Would glass be a good choice for a meat tray? Because...

Once sorted into groups, students determine their own criteria to resort items. Use the following prompts:

- Describe the types of items in the collection.
- Which group of items are nearly all the same size?
- What items in the collection have very different sizes?
- What can you tell me about the collection?

Have students sort the same collection into half or double the amount of groups (ie two groups instead of four groups or four groups instead of two). Ask students:



- What would you call each group?
- How have you organised your information compared to other students?

Have students classify objects using physical characteristics (eg heaviest to lightest, biggest to smallest, colour etc.). A collection of plastic bottles or cardboard boxes could be sorted according to mass, size or colour. Ask students:

- Are there more large ones or small ones?
- Are there more green ones than orange ones?
- Are there more heavier ones than lighter ones?

If students are experiencing difficulty with ordering, ask:

- What is the problem?
- How could we decide where to put that item?
- What do we mean by large and small, heavier or lighter?

Clarify misconceptions regarding quantity and size or mass and size. For example, if there were five large bottles and five small bottles, are there more large bottles than small bottles?

Part 4: Tally

Working in groups students count and tally items in a selected classification (ie material, shape or size). If there are a large number of items it is suggested to tally a small collection of these items so that numbers are more appropriate for the follow-on graphing activity.

Students record results using either their own method, an electronic one-way table (ie a table with 'sort' options or a spreadsheet) or [Student resource sheet 1.4: Materials in our recyclable items](#).

Once the students have collected their data, ask:



- What is the best way to record the information?
- How will you show different groups?

Can you use numbers to show how many of each item you have?

Can you use your recordings to see how many of each item you have without counting them?

- Can you see any interesting trends?

Part 5: I do, we do

This part creates opportunity for students to transfer concrete information (ie different types of items) to abstract information (ie numbers).

Using a selection of items, model the creation of a pictograph using the template on the second page of [Student resource sheet 1.4: Materials in our recyclable items](#).

Ask students to draw a picture of an item from the selection of items on a square of paper. Arrange the squares of paper in the column corresponding to the label, creating the graph together. Ask students:



- Can you use the graph to tell us which item we have the most of without counting each picture? How?

Part 6: You do

Working in small groups, students use pictures to create their own graph to represent their data, using a 1:1 ratio.

Once finished, ask students to mark the top of the highest square piece of paper in each column. Then remove all of the square pieces of paper and, using different colours, colour each column.

Prompt students to think about the information the graph represents.



- Which item has the tallest column? The smallest column?
- What does this tell us?
- Why do we use so muchin our packaging?

Part 6: Reflection

Students record responses to the following questions in the class reflective journal:

- Describe some different materials and shapes you investigated today.
- Are there properties that make some materials more suitable for building?
- Which materials would be best for making your most magnificent thing? Why?

Properties of materials will be investigated in Activity 2.

Ideas can be represented through drawings, photos, mind maps or structured sentences.

Resource sheets

[Teacher resource sheet 1.0: Sample parent letter](#)

[Teacher resource sheet 1.1: Cooperative learning – Roles](#)

[Teacher resource sheet 1.2: Cooperative learning – Think, Pair, Share.](#)

[Student activity sheet 1.3: I see, I think, I wonder](#)

[Student resource sheet 1.4: Materials in our recyclable items](#)

Material labels are available from

www.twinkl.co.uk/resource/t-t-17590-materials-word-wall-pack (Twinkl, 2017)

This is a free download but requires an account.

Literary resources

Alternative book options along similar lines to *The Most Magnificent Thing* include:

- *Iggy Peck Architect* by Andrea Beaty
- *Rosie Revere, Engineer* by Andrea Beaty
- *Anything Is Possible* by Giulia Belloni and Marco Trevisan
- *Going Places* by Peter and Paul Reynolds
- *Copernicker The Invention* by Wouter van Reek
- *What Do You Do With An Idea?* by Kobi Yamada
- *The Magnificent tree* by Nick Bland

Digital resources

The Most Magnificent Thing Stop Motion animated by Elmwood School in Ottawa (Mr Mattperreaut, 2015)
www.youtube.com/watch?v=GgECc3gKuTo

The Most Magnificent Thing by Ashley Spires (read aloud) (Stories that build character and more...,2017)
www.youtube.com/watch?v=SzVB7JzQMzs

Activity 2: Explore properties and shapes

Activity focus



In this activity, students explore the properties and shapes of collected items and decide what will be useful in creating their own most magnificent thing.

Background information

Objects and materials have properties such as strength, transparency and water resistance. Strength refers to the ability of an object to not change shape when exposed to compression (squashing) or stretching forces. Transparency refers to the extent to which materials allow light to pass through them. Transparent materials such as flat glass allow light to pass through without diffusion, textured glass diffuses light as it passes through and is considered translucent, while opaque objects such as a wooden plank will not allow any light to pass through. Water resistance refers to the extent to which an object will allow water to permeate (eg water resistant materials such as plastic sheeting).

The properties of objects are largely determined by the material from which they are made.

However, the shape of an object may also contribute to its properties. For example, a flat sheet of glass is less strong than glass formed into the shape of a bottle. Some recyclable items have regular shapes, for example cylindrical cans. Others, such as crumpled newspaper, have irregular shapes. Objects can be categorised as either two-dimensional (eg squares) or three-dimensional (eg prisms).

Instructional procedures

Student thinking from the lesson should be recorded as annotations in the class reflective journal, along with photos that have been taken.


During testing, encourage students to consider the materials they will use for their designs:

- Would this new information be important when you are choosing materials for your most magnificent thing?

Expected learning	<p>Students will be able to:</p> <ol style="list-style-type: none"> 1. Follow simple procedures to test the properties of materials, and make and record observations in a provided table (Science). 2. Recognise and classify familiar two-dimensional figures and three-dimensional objects (Mathematics).
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Equipment required	<p>For the class:</p> <p>Collected recyclable items, and a list of material properties and shapes to investigate.</p> <p>A torch to test transparency (one per group)</p> <hr/> <p>For the students:</p> <p>Books or other masses such as large blocks</p> <p>Water and an eye dropper to test if materials are water-resistant.</p>
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Preparation	Using the previously collected items from <i>Activity 1</i> , decide what shapes and properties students will investigate prior to beginning the activity.
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Activity parts	<p>Part 1: Classify</p> <p>Working in small groups of three or four, students sort collected recyclable items by shape.</p> <p>Questioning can be used to guide students through the process.</p> <div style="display: flex; align-items: flex-start;"> <div style="margin-right: 10px;">  </div> <ul style="list-style-type: none"> • What shapes are the items? What parts do they have in common (edge, face, side)? Could this help us group them? • Are there some items that belong in two categories? • Are there unfamiliar shapes or objects? How could we group these? • Could we group the items in a different way? Why? • Which shapes will be good for building a most magnificent thing? Why? • Which shapes would be strong? Why? Because... • How could we test their strength? </div> <hr/> <p>Part 2: Test - strength</p> <p>Students test the material properties of the items. Each group may test a different type of material (eg metal, plastic, cardboard, fabric, rubber or foam).</p>
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Students test the strength of the recyclable items by placing blocks or books on top of them to determine how much weight they can support. Care needs to be taken when choosing materials to test.

Note: The testing may not be fair from a scientific perspective, however the purpose is for students to see which materials will be best for different parts of their design.



- Which items were the strongest? How many books/blocks did they hold?
- Which items were the weakest? How many books/blocks did they hold?
- Which items would be useful in your most magnificent thing? Why?

Note: When a material is formed into different shapes its properties change. For example cardboard folded into a triangular prism or rolled into a tube is much stronger than a flat sheet of cardboard. The strength testing can be used to compare the same material when formed into different shapes.

Students can record their results using [Student activity sheet 2.1: Material properties – Strength](#).

Part 3: Test – transparency

Students investigate materials to see if they are transparent by holding them up to the light and seeing if they can see through them.



- Which materials were transparent? How do you know?
- Which materials were not transparent? How do you know?
- How could you use transparent materials? Why?

Students can record their results using [Student activity sheet 2.2: Material properties – Transparency](#).

Part 4: Test - water-resistance

Students investigate materials to see if they are water-resistant by adding drops of water to samples of the materials (eg paper, plastic, cardboard) placed flat on the table.



- What happens to the water when dropped on ...?
- Do the drops stay on the surface, soak in or drip through the material onto the table? Why?

- Which of the materials was most water-resistant? How do you know this?
- Which material was least water-resistant? How do you know this?
- What happens to the materials when they get wet?
- How could you use water-resistant materials? Why?
- Are materials that soak up water useful? How would you use them? Why?

Students can record their results using [Student activity sheet 2.3: Material properties – Water-resistance](#).

Part 4: Journaling

Students record what they have learnt in the class reflective journal and begin to brainstorm the types of materials they might use to build their most magnificent thing. Prompt student responses using a focus question:



- Which materials will you use to build your most magnificent thing? Why?

Resource sheets

[Student activity sheet 2.1: Material properties – Strength](#)

[Student activity sheet 2.2: Material properties – Transparency](#)

[Student activity sheet 2.3: Material properties – Water-resistance](#)

Digital resources

2D Shape Word Mat – available from www.twinkl.co.uk/resource/t-n-105-2d-shape-word-mat

3D Shape Word Mat – available from www.twinkl.co.uk/resource/t-n-106-3d-shape-word-mat

BBC Science Clips – *Characteristics of materials* (BBC, 2014) www.bbc.co.uk/schools/scienceclips/ages/7_8/characteristics_materials_fs.shtml

BBC Science Clips – *Grouping and changing materials* (BBC, 2014) www.bbc.co.uk/schools/scienceclips/ages/6_7/grouping_materials.shtml

BBC Science Clips – *Sorting and using materials* (BBC, 2014) www.bbc.co.uk/schools/scienceclips/ages/5_6/sorting_using_materials.shtml

Everyday Materials Property Word Cards – available from
www.twinkl.co.uk/resource/t-sc-094-ks1-everyday-materials-property-word-cards (Twinkl, 2017)

Activity 3: Design, draw and create

Activity focus



In this activity, students draw an annotated design of their own most magnificent thing, explaining its role or purpose. They use this design to build their most magnificent thing from recycled materials and reflect on the design process.

Instructional procedures

Designing typically progresses from understanding a need to imagining what might be developed to address that need.

The [Design process guide](#) is included as a resource to provide assistance to teachers in understanding the complete design process as developed in the technologies syllabus.

Students may find it difficult to imagine a need for their design to fulfill. Scaffold this part of the design process giving specific design criteria. For instance, the most magnificent thing could fulfill a need for a teddy such as a chair, or create something to fulfill a need at home, a design solution for storing objects or collections of growing plants, or something useful for pets or cooking. Students could also create a toy.

To further link to the science curriculum, the students could be directed to create an instrument (Physical Science) or a habitat for animals (Biological Science).

Once imagined, planning is required to identify the materials required and tools needed for construction.

A labelled diagram can clarify how each component relates to others and the specifications of the materials. The labelled diagram guides the *design process*.

During construction, new insights may emerge which initiate revisions. Further improvements are often made to the design following feedback on the prototype.

Refer to [Teacher resource sheet 3.3: Construction skills](#) for tips on joining and binding items. Photographs or videos of the construction processes can be taken for digital presentations in *Activity 4*. The teacher guides students through the design process as they participate in this activity, see [Design process guide](#).

Student thinking from the lesson should be recorded as annotations in the class reflective journal, along with photos that have been taken.

Expected learning	Students will be able to: <ol style="list-style-type: none">1. Imagine, design and construct an object for a purpose (Technologies).2. Explain how objects can be changed physically for construction purposes (Science).3. Create a detailed, labelled diagram (Technologies).
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Equipment required	For the class: <p>Collected items from <i>Activity 1</i> and supplies for construction including: tape, scissors, cutting mats, glue sticks, PVA glue, paintbrushes, hot glue (to be used by an adult) etc.</p>
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For the students:

Design worksheets:

[Student activity sheet 3.1: Materials used](#)

[Student activity sheet 3.2: Shapes or objects](#)

Preparation	Adult help for construction. <u>Teacher resource sheet 3.3: Construction skills</u>
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Activity parts	Part 1: Class discussion <p>Discuss the process the girl in <i>The Most Magnificent Thing</i> book underwent to build her creation.</p> <ul style="list-style-type: none">• What steps did the girl follow between having an idea and building her most magnificent thing?• When she had her idea, did she start building straight away?• What did she do first?• If you could make anything what would you make?• Why would you make your most magnificent thing? What purpose would your thing have? How would it be useful to you?• What materials will be useful for your most magnificent thing?• What shapes will be useful for your most magnificent thing?• What type of items are most plentiful?
-----------------------	--

Part 2: Ideation

As a class discuss what useful things could be made from recycled materials. To enable students to share ideas about how to meet these needs use a think-pair-share activity ([Teacher resource sheet 1.2: Cooperative learning – Think, Pair, Share](#)). The ideas from this discussion are to inspire students in their design.

Decide if students will work individually or in groups; this will depend on whether the focus is on individual work and design skills, or on personal capability skills of collaborating and managing.

Part 3: Development

Students name and describe the purpose of their most magnificent thing. Students should identify:



- Our/my magnificent thing is a (name).
- Our/my magnificent thing will be useful for (what it will do), because (the need it will meet).

Students draw their designs and use labels to identify the items they will use to build their most magnificent thing.

Drawing apps (such as *Doodle Buddy* or *Draw Free*) could be used during the design process. Students could create a movie or voice memo to explain their plan and the purpose of their most magnificent thing.

Students list the materials and shapes in their design ([Student activity sheet 3.1: Materials used](#) and [Student activity sheet 3.2: Shapes or objects](#)).

Part 4: Gallery walk

Students participate in a gallery walk to offer feedback on others designs. Feedback may include something they like about a design and something they suggest improving.

Part 5: Production

Students follow their design plan to build their most magnificent thing. Adult assistance may be required throughout this process.

Question students about the process



- What are you making?
- What is its purpose?

- How are you joining pieces? Why did you choose that method?
- Are you able to follow your plan or did you have to make changes? Why did you need to change your plan?
- What problems have you had with your construction?
- Is that how you hoped it would be? Because...
- What could you do to make it stronger?

Support students in documenting the design process by capturing digital images.

[Teacher resource sheet 3.3: Construction skills](#) is a useful resource for this activity.

Part 6: Evaluation

Conduct a review of the construction process. Ask students if they needed to alter materials to make their most magnificent thing.



- What objects or materials did you change when making your most magnificent thing?
- How did you change them? Did you change the shape of the objects? Did you change the size?

Record student reflections of the design process in the class reflective journal.

Resource sheets

[Teacher resource sheet 1.2: Cooperative learning – Think, Pair, Share](#)

[Student activity sheet 3.1: Materials used](#)

[Student activity sheet 3.2: Shapes or objects](#)

[Teacher resource sheet 3.3: Construction skills](#)

Digital resources

Doodle Buddy

itunes.apple.com/au/app/doodle-buddy-paint-draw-scribble/id313232441?mt=8

Draw Free

itunes.apple.com/au/app/draw-free-for-ipad/id366755447?mt=8



Most Magnificent Thing





Instrument


My instrument can make music after school when I am bored.

bubble wrap


Sticky Tape

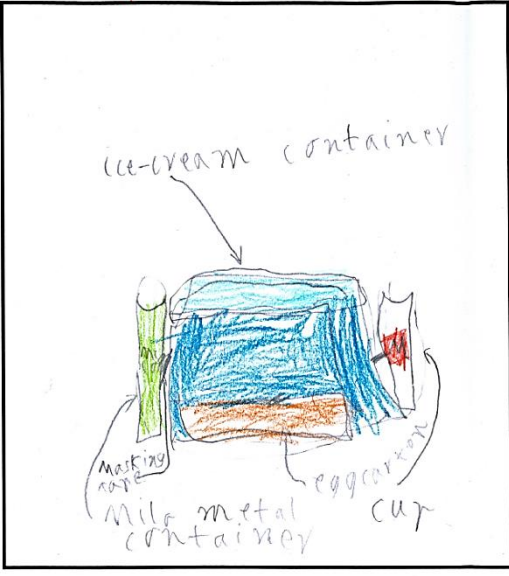
Cardboard roll

newspaper



Most Magnificent Thing





Pencil pot

My pencil pot stores my pencils, crayons, markers and colored pencils.

Ice-cream container

Milk metal container cup

egg carton

Masking tape

Student work samples showing design plans for their most magnificent things

After completing their most magnificent things, the students reflected on the design process, the changes they made and how their creations met their needs.



These images show a student's most magnificent thing, an automatic pet feeder. They illustrate the design process where the student sought feedback and improved on the original design idea



Activity 4: Present and explain

Activity focus



In this activity, students reflect on their completed most magnificent thing and justify changes to the design plan.

Students communicate the design process through a chosen form of digital media. Presentations are shared with the class and an external audience where possible.

Instructional procedures

Students will need support and scaffolding to help them both prepare for their presentation and to present. Group-based presentations could be prepared in groups of three or four students and, to scaffold cooperative group work, each member of the group could have a role and responsibilities. For further information on possible roles and how they can work within a group refer to [Teacher resource sheet 1.1: Cooperative learning – Roles](#). All students contribute in three phases: deciding on the content, preparing the media and presenting. Each student could have overall responsibility for managing a phase of the task.

It is assumed that presentations will be made by groups. Presentations will last 3-5 minutes and may have to be scheduled over two separate lessons.

The presentations provide a rich opportunity for assessing the students' understanding of the science and technology principles and processes, as well as the literacies associated with speaking and listening

Students can be given a choice of creating a presentation with a range of presentation types (eg *iMovie* or *Explain everything*). Presentations can then be shared through *Connect*, *Seesaw* or *Class Dojo*, or shared on the interactive whiteboard. Students may require explicit instruction in using apps.

If digital technology is not accessible, students could share their project using a traditional poster, recount or book.

Student thinking from the lesson should be recorded as annotations in the class reflective journal, along with photos from the activities.

Expected learning	Students will be able to: <ol style="list-style-type: none">1. Explain what their object is, how it will be useful, how it was constructed and why particular materials were used (Technologies).2. Compare their initial design with the constructed object and justify differences (Technologies).3. Create a digital representation of their creation and design process using a digital platform to share thinking (Technologies).
--------------------------	--

Equipment required **For the class:**

Class reflective journal

For the students:

A device with an appropriate app for creating a digital presentation (see *Digital resources* for suggestions).

Preparation

Devices will need to be charged and loaded with appropriate apps.

Presentations may have to be scheduled for two separate sessions.

Consider the length of the presentations. Two minutes is a good length for speaking, with two minutes for questions and two minutes swap over between groups.

Invite members of the community to join the audience for the presentations.

Activity parts**Part 1: Analysing**

Students analyse their most magnificent thing, count the materials used, and compare this to their initial design plan.



- What materials were used most? Why?
- What wasn't used? Why?
- What shapes were used most? Why?

Students compare their finished product to their planned design using [Student activity sheet 4.1: Analysis](#).

Comparisons can also be recorded in the class reflective journal.

Part 2: Presentation content

Students decide on and write the content of the presentation.

Presentations should focus on the objects the students have made, the purpose of their most magnificent thing and their choice of materials as outlined in their design plan. Students should also share what they have learnt as they have worked through the activities. Students should justify any changes made during the construction process.

Part 3: Choosing media

With teacher guidance, students choose a form of digital media to communicate their design process. See *Digital resources* for suggestions.

Part 4: Creating presentation

Planning questions can include:

- How long will the presentations be?
- Who will speak? One person may introduce the presentation, another give the presentation and a third answer any questions.

Students may require explicit instruction or help from a buddy class to use technology.

If digital technology is not accessible, students could share their project using a traditional poster, recount or book.

Part 5: Sharing

Students share their presentations with their peers and, where possible, an audience beyond the classroom. The work may be shared with parents via *Connect*, a portal, class blog or other digital platform.

Part 6: Reflecting

Students reflect on the STEM module and their learning journey. They could represent their learning as a timeline using a combination of words and pictures.

Resource sheets [*Teacher resource sheet 1.1: Cooperative learning – Roles*](#)
[*Student activity sheet 4.1: Analysis*](#)

Digital resources Comic Life
itunes.apple.com/us/app/comic-life/id432537882?mt=8&ign-mpt=uo%3D4 (\$4.99)

Pixton Comic Maker
itunes.apple.com/au/app/pixton-comic-maker/id1000914010?mt=8

iBooks Author
www.apple.com/au/ibooks-author/

Book Creator
itunes.apple.com/au/app/book-creator-for-ipad-create/id442378070?mt=8 (\$7.99)

iMovie
itunes.apple.com/au/app/imovie/id377298193?mt=8

Pages
itunes.apple.com/au/app/pages/id361309726?mt=8

Keynote
itunes.apple.com/au/app/keynote/id361285480?mt=8

Connect – the DoE portal for teachers
connect.det.wa.edu.au

Seesaw Digital Portfolio
web.seesaw.me

Class Dojo
www.classdojo.com

Appendix 1A: Links to the Western Australian Curriculum

The *Our magnificent thing* module provides opportunities for developing students' knowledge and understandings in science, technologies and mathematics. The table below shows how this module aligns to the content of the Western Australian Curriculum and can be used by teachers for planning and monitoring.

OUR MAGNIFICENT THING	ACTIVITY			
	1	2	3	4
Links to the Western Australian Curriculum				
SCIENCE				
SCIENCE UNDERSTANDING				
Chemical sciences: Everyday materials can be physically changed in a variety of ways (ACSSU018)			•	
SCIENCE INQUIRY SKILLS				
Planning and conducting: Participate in guided investigations to explore and answer questions (AC SIS025)		•		
DESIGN AND TECHNOLOGIES				
KNOWLEDGE AND UNDERSTANDING				
Materials and technologies specialisations: Characteristics and behaviours of individual materials used in products (ACTDEK004)	•			
PROCESS AND PRODUCTION SKILLS				
Designing: Develop and communicate design ideas through describing, drawing, modelling and/or a sequence of written or spoken steps			•	
DIGITAL TECHNOLOGIES				
PROCESS AND PRODUCTION SKILLS				
Collecting, managing and analysing data : Present data of any kind using a variety of digital tools (ACTDIP003)				•

MATHEMATICS				
MEASUREMENT AND GEOMETRY				
Using units of measurement: Recognise and classify familiar two-dimensional shapes and three-dimensional objects using obvious features (ACMMG022)		•		
STATISTICS AND PROBABILITY				
Data representation and interpretation: Represent data with objects and drawings where one object or drawing represents one data value. Describe the displays (ACMSP263)	•			

Further information about assessment and reporting in the Western Australian Curriculum can be found at: <https://k10outline.scsa.wa.edu.au/home>

Appendix 1B: Mathematics proficiency strands

Source:

www.australiancurriculum.edu.au/f-10-curriculum/mathematics/key-ideas/?searchTerm=key+ideas#dimension-content

Key ideas

In Mathematics, the key ideas are the proficiency strands of understanding, fluency, problem-solving and reasoning. The proficiency strands describe the actions in which students can engage when learning and using the content. While not all proficiency strands apply to every content description, they indicate the breadth of mathematical actions that teachers can emphasise.

Understanding

Students build a robust knowledge of adaptable and transferable mathematical concepts. They make connections between related concepts and progressively apply the familiar to develop new ideas. They develop an understanding of the relationship between the 'why' and the 'how' of mathematics. Students build understanding when they connect related ideas, when they represent concepts in different ways, when they identify commonalities and differences between aspects of content, when they describe their thinking mathematically and when they interpret mathematical information.

Fluency

Students develop skills in choosing appropriate procedures; carrying out procedures flexibly, accurately, efficiently and appropriately; and recalling factual knowledge and concepts readily. Students are fluent when they calculate answers efficiently, when they recognise robust ways of answering questions, when they choose appropriate methods and approximations, when they recall definitions and regularly use facts, and when they can manipulate expressions and equations to find solutions.

Problem-solving

Students develop the ability to make choices, interpret, formulate, model and investigate problem situations, and communicate solutions effectively. Students formulate and solve problems when they use mathematics to represent unfamiliar or meaningful situations, when they design investigations and plan their approaches, when they apply their existing strategies to seek solutions, and when they verify that their answers are reasonable.

Reasoning

Students develop an increasingly sophisticated capacity for logical thought and actions, such as analysing, proving, evaluating, explaining, inferring, justifying and generalising. Students are reasoning mathematically when they explain their thinking, when they deduce and justify strategies used and conclusions reached, when they adapt the known to the unknown, when they transfer learning from one context to another, when they prove that something is true or false, and when they compare and contrast related ideas and explain their choices.

Appendix 2: General capabilities continuums

The general capabilities continuums shown here are designed to enable teachers to understand the progression students should make with reference to each of the elements. There is no intention for them to be used for assessment.

Information and communication technology (ICT) capability learning continuum

Sub-element	Typically by the end of Foundation Year	Typically by the end of Year 2	Typically by the end of Year 4
Create with ICT Generate ideas, plans and processes	use ICT to follow or contribute to a simple plan for a solution	use ICT to prepare simple plans to find solutions or answers to questions	use ICT to generate ideas and plan solutions
Create with ICT Generate solutions to challenges and learning area tasks	use ICT as a creative tool to generate simple solutions, modifications or data representations for personal or school purposes	experiment with ICT as a creative tool to generate simple solutions, modifications or data representations for particular audiences or purposes	create and modify simple digital solutions, creative outputs or data representation/transformation for particular purposes
Communicating with ICT Collaborate, share and exchange	use purposefully selected ICT tools safely to view information shared by trusted adults	use purposefully selected ICT tools safely to share and exchange information with appropriate local audiences	use appropriate ICT tools safely to share and exchange information with appropriate known audiences

Critical and creative thinking learning continuum

Sub-element	Typically by the end of Foundation Year	Typically by the end of Year 2	Typically by the end of Year 4
Inquiring – identifying, exploring and organising information and ideas Organise and process information	gather similar information or depictions from given sources	organise information based on similar or relevant ideas from several sources	collect, compare and categorise facts and opinions found in a widening range of sources
Generating ideas, possibilities and actions Imagine possibilities and connect ideas	use imagination to view or create things in new ways and connect two things that seem different	build on what they know to create ideas and possibilities in ways that are new to them	expand on known ideas to create new and imaginative combinations
Generating ideas, possibilities and actions Seek solutions and put ideas into action	predict what might happen in a given situation and when putting ideas into action	investigate options and predict possible outcomes when putting ideas into action	experiment with a range of options when seeking solutions and putting ideas into action
Reflecting on thinking and processes Transfer knowledge into new contexts	connect information from one setting to another	use information from a previous experience to inform a new idea	transfer and apply information in one setting to enrich another

Personal and social capability learning continuum

Sub-element	Typically by the end of Foundation Year	Typically by the end of Year 2	Typically by the end of Year 4
Social management Work collaboratively	share experiences of cooperation in play and group activities	identify cooperative behaviours in a range of group activities	describe characteristics of cooperative behaviour and identify evidence of these in group activities
Social management Negotiate and resolve conflict	listen to others' ideas, and recognise that others may see things differently from them	practise solving simple interpersonal problems, recognising there are many ways to solve conflict	identify a range of conflict resolution strategies to negotiate positive outcomes to problems
Social management Develop leadership skills	identify ways to take responsibility for familiar tasks at home and school	discuss ways in which they can take responsibility for their own actions	discuss the concept of leadership and identify situations where it is appropriate to adopt this role

Further information about general capabilities is available at:

k10outline.scsa.wa.edu.au/home/p-10-curriculum/general-capabilities-over/general-capabilities-overview/general-capabilities-in-the-australian-curriculum

Appendix 3: Materials list

The following materials are required to complete this module.

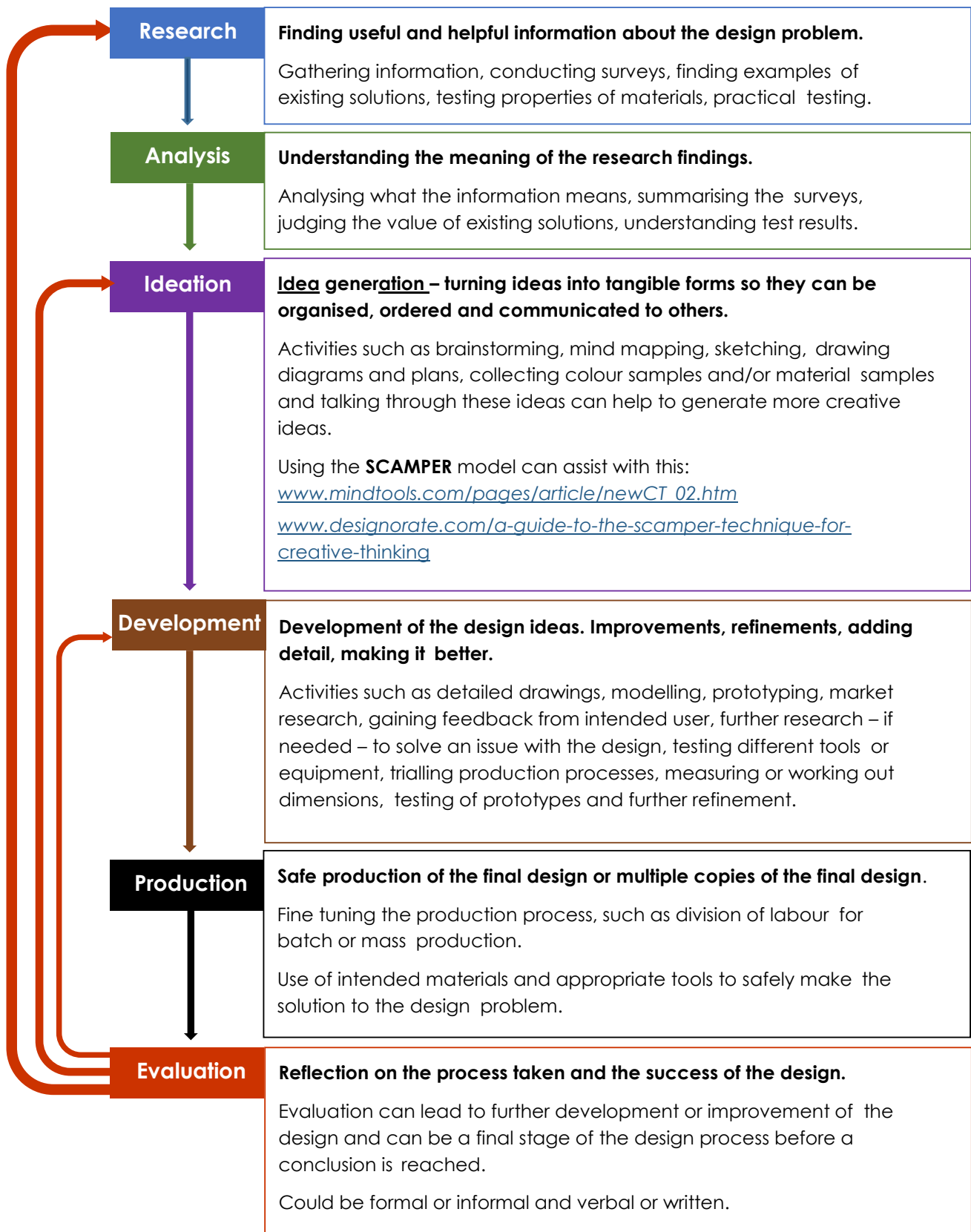
A range of recyclable items, including:

- newspaper
- cans
- plastic bottles
- ice-cream containers
- yoghurt containers
- shoe boxes
- plastic wrapping
- boxes
- foil
- fabric scraps
- egg cartons
- bottle caps.

A selection of cutting and construction tools such as:

- tape
- scissors
- cutting mats
- glue sticks
- PVA glue
- paint brushes
- hot glue guns (used by adults)
- tacks
- cable ties
- string.

Appendix 4: Design process guide



Appendix 5: Reflective journal

When students reflect on learning and analyse their own ideas and feelings, they self-evaluate, thereby improving their metacognitive skills. When students self-monitor or reflect, the most powerful learning happens.



Journaling may take the form of a written or digital journal, a portfolio or a digital portfolio. Early childhood classrooms may use a class reflective floor book with pictures of the learning experience and scribed conversations.

Teachers can model the journaling process by thinking aloud and showing students how they can express learning and thoughts in a variety of ways including diagrams, pictures and writing.

Journals are a useful tool that gives teachers additional insight into how students value their own learning and progress, as well as demonstrating their individual achievements.

The following links provide background information and useful apps for journaling.

Kidblog – digital portfolios and blogging

kidblog.org/home

Edmodo – for consolidating and storing class notes and learning materials

www.edmodo.com/

Explain Everything™ – a screen casting, video and presentation tool all in one

explaineverything.com

Popplet – allows you to jot down your ideas and then sort them visually

Popplet.com

Seesaw – for capturing work completed by students in class, using a device's camera function

web.seesaw.me

Connect – the DoE portal for teachers

connect.det.wa.edu.au

Evernote (a digital portfolio app)

evernote.com

Digital portfolios for students (Cool tools for school)

cooltoolsforschool.wordpress.com/digital-student-portfolios

Appendix 6: Teacher resource sheet 1.0: Sample parent letter

(School details and letterhead)

(Date)

Dear parents/caregivers,

RE: COLLECTING ITEMS FOR *OUR MAGNIFICENT THING* STEM PROJECT

Our class is undertaking a STEM (Science, Technology, Engineering and Mathematics) project called *Our magnificent thing*. Based on the picture book *The Most Magnificent Thing* by Ashley Spires, this project will involve students in our class repurposing recyclable items to create their own most magnificent thing (something of value to them).

This project focuses on repurposing recyclable items to give students opportunities to consider sustainability and the impact of our lifestyles on our environment, while developing their ability to design, create and problem-solve. To enable students to create their most magnificent things, we would appreciate if you could please collect clean recyclable items from your house (over a one-week period). Please do not include any alcoholic containers or toilet rolls.

We would like the recyclable items to be delivered to the classroom before (date).

We will be collecting data on the shape and material properties of the items before using them to create something magnificent. We may require adult assistance during the construction phase so please let me know if you are available to help.

Thank you in advance,

(Classroom teacher)

Appendix 7: Teacher resource sheet 1.1: Cooperative learning – Roles

Cooperative learning frameworks create opportunities for groups of students to work together, generally to a single purpose.

As well as having the potential to increase learning for all students involved, using these frameworks can help students develop personal and social capability.

When students are working in groups, positive interdependence can be fostered by assigning roles to group members.



These roles could include:

- working roles such as Reader, Writer, Summariser, Time-keeper.
- social roles such as Encourager, Observer, Noise monitor, Energiser.

Teachers using the *Primary Connections* roles of Director, Manager and Speaker for their science teaching may find it effective to also use these roles for STEM learning.

Further to this, specific roles can be delineated for specific activities that the group is completing.

It can help students if some background to the purpose of group roles is made clear to them before they start, but at no time should the roles get in the way of the learning. Teachers should decide when or where roles are appropriate to given tasks.



Appendix 8: Teacher resource sheet 1.2: Cooperative learning – Think, Pair, Share

This resource sheet provides a brief outline of a cooperative learning strategy known as 'think – pair – share'.

Cooperative learning frameworks create opportunities for groups of students to work together, generally to a single purpose.

As well as having the potential to increase learning for all students involved, using these frameworks can help students develop personal and social capability.

In the 'think' stage, each student thinks silently about a question asked by the teacher.

In the 'pair' stage, students discuss their thoughts and answers to the question in pairs.

In the 'share' stage, the students share their answer, their partners answer or what they decided together. This sharing may be with other pairs or with the whole class. It is important also to let students 'pass'. This is a key element of making the strategy safe for students.

Think – pair – share increases student participation and provides an environment for higher levels of thinking and questioning.



Appendix 9: Student activity sheet 1.3: I see, I think, I wonder

What do you see when you look at this image?



What are you thinking about as you look at this image?



What are your wonderings (questions)?



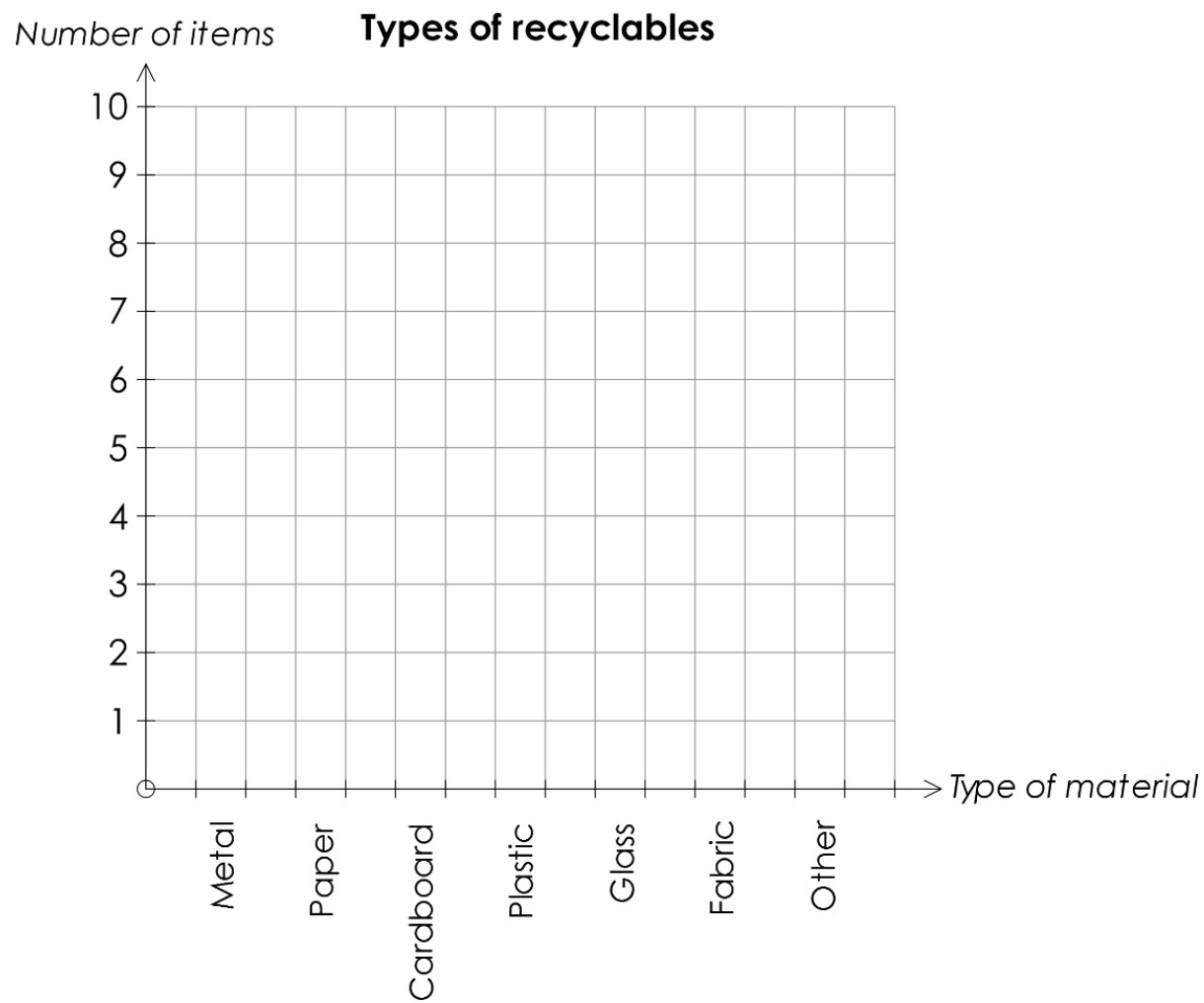
Appendix 10: Student resource sheet 1.4: Materials in our recyclable items

What recyclable materials were collected by the class?

Table of results:

Material	How many?
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	

Graph of results:



Appendix 11: Student activity sheet 2.1: Material properties – Strength

If something is strong, it can hold a lot of blocks.

It is recommended glass or plastic are not used for strength tests.

Object	Number of blocks held	Did the object change shape?
1.		
2.		
3.		
4.		
5.		
6.		

The strongest object was _____

The weakest object was _____

Appendix 12: Student activity sheet 2.2: Material properties – Transparency

If something is transparent you can see clearly through it.



Object tested	Was it transparent? Yes or No?
1.	
2.	
3.	
4.	
5.	
6.	

The most transparent object was _____

The least transparent object was _____

Appendix 13: Student activity sheet 2.3: Material properties – Water-resistance

If something is water-resistant, very little to no water will soak into it or drip through it.



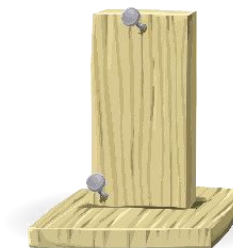
Object tested	Was it water-resistant? Yes or No?
1.	
2.	
3.	
4.	
5.	
6.	

The most water-resistant object was _____

The least water-resistant object was _____

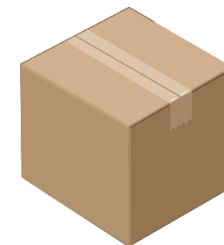
Appendix 14: Student activity sheet 3.1: Materials used

Materials we used to make our most magnificent thing



Material	Why we used this material

Appendix 15: Student activity sheet 3.2: Shapes or objects



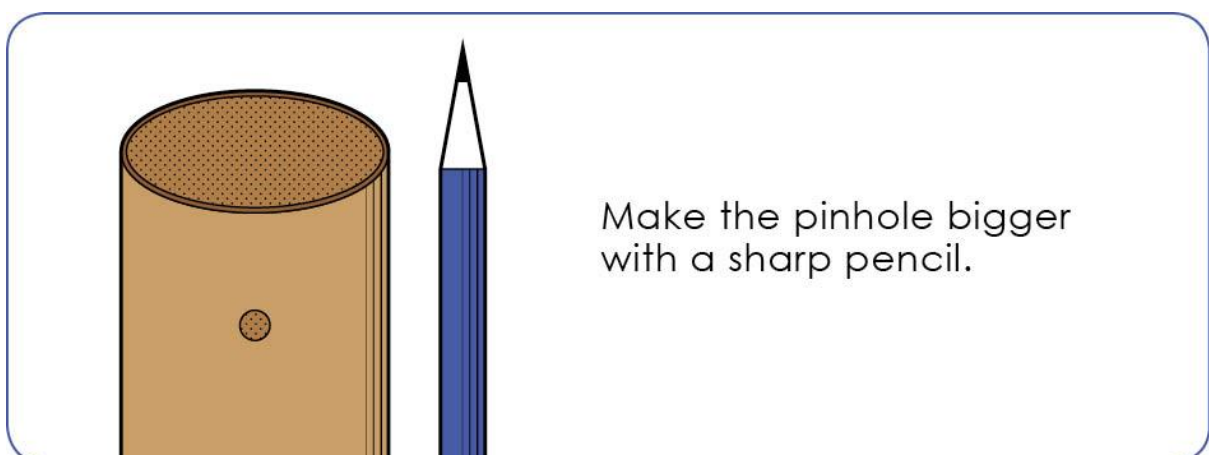
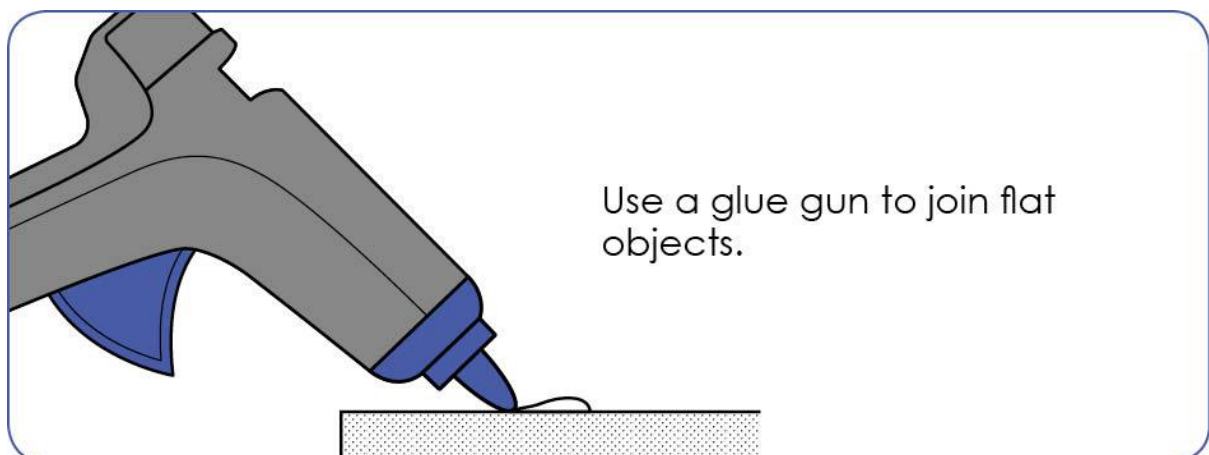
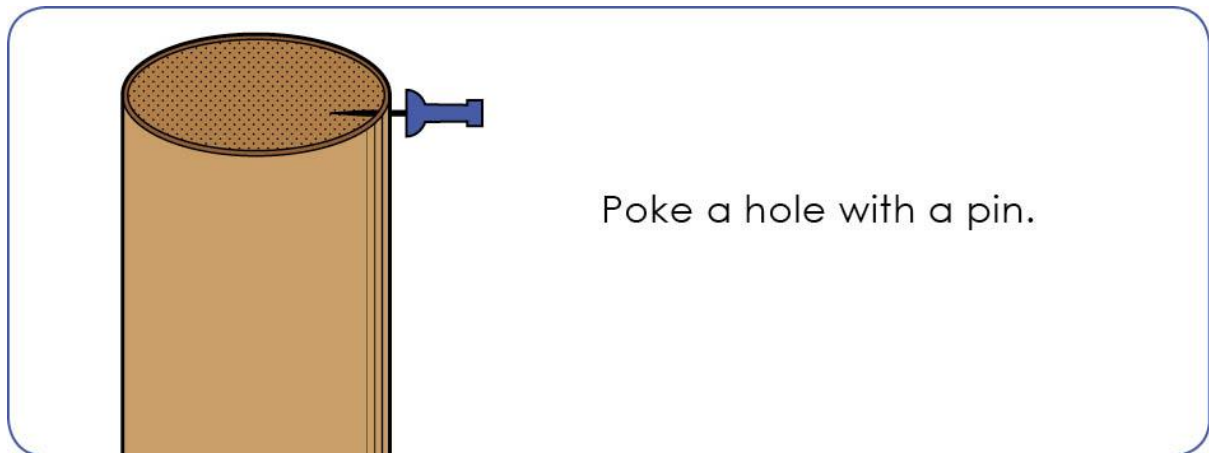
Shapes or objects we used in our most magnificent thing

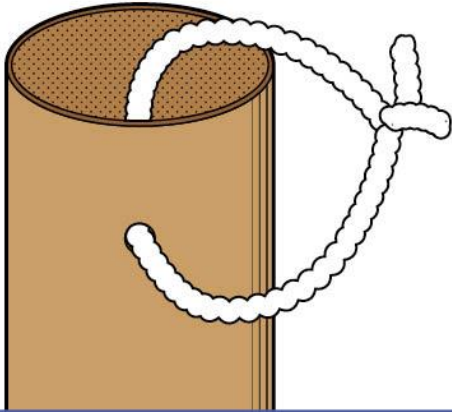
Shape or object	How many can we count in our most magnificent thing?

Appendix 16: Teacher resource sheet 3.3: Construction skills

Construction skills help students to generate and produce solutions for real-world problems.

This resource can be used as a visual stimulus to prompt students to develop solutions to design problems. The cards can be printed to create stations.

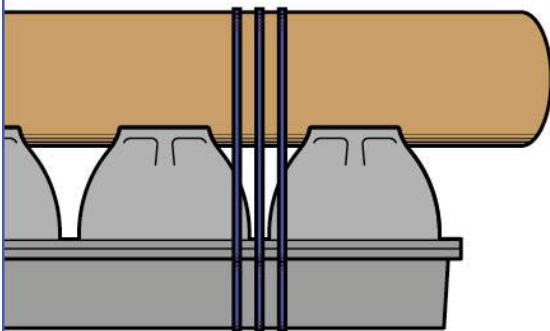




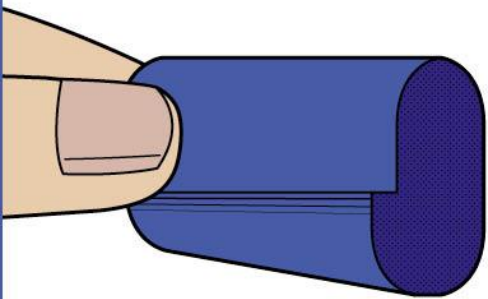
Make a loop using a pipe cleaner.



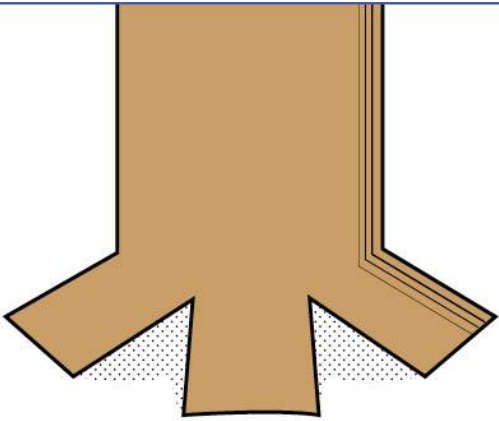
Use a paper binder to fasten objects together.



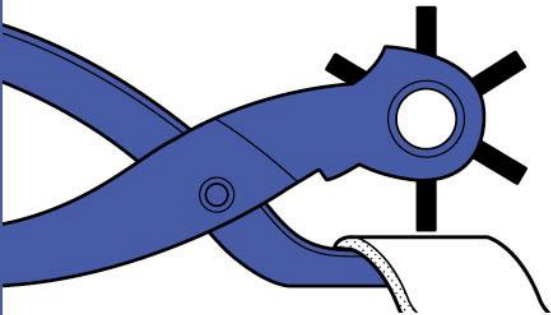
Use cable ties to tie objects together.



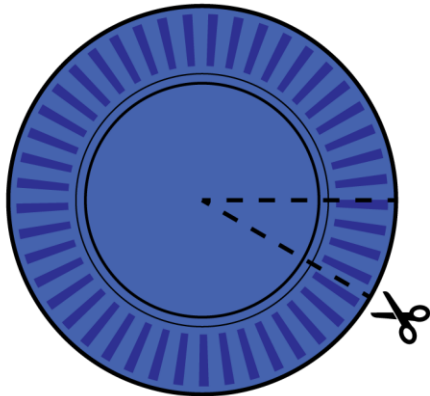
Make a tape loop with the sticky side on the outside.



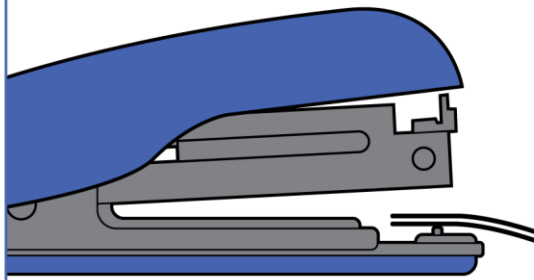
Cut the end of a tube into a fan to attach it to a flat object.



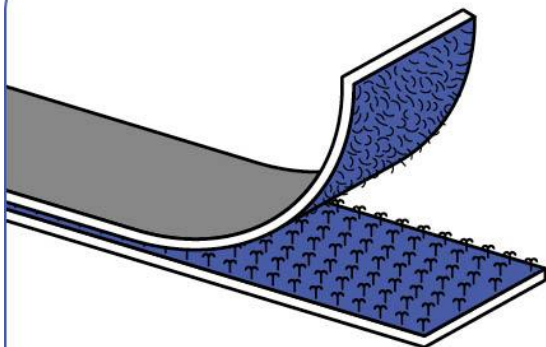
Use a leather hole punch to make holes in objects.



Cut a sector out of a paper plate, and join the edges to make a cone shape.



Use a stapler to join materials together.



Use velcro to join objects.

Appendix 17: Student activity sheet 4.1: Analysis

Write the steps you took to make your most magnificent thing.



What is it?

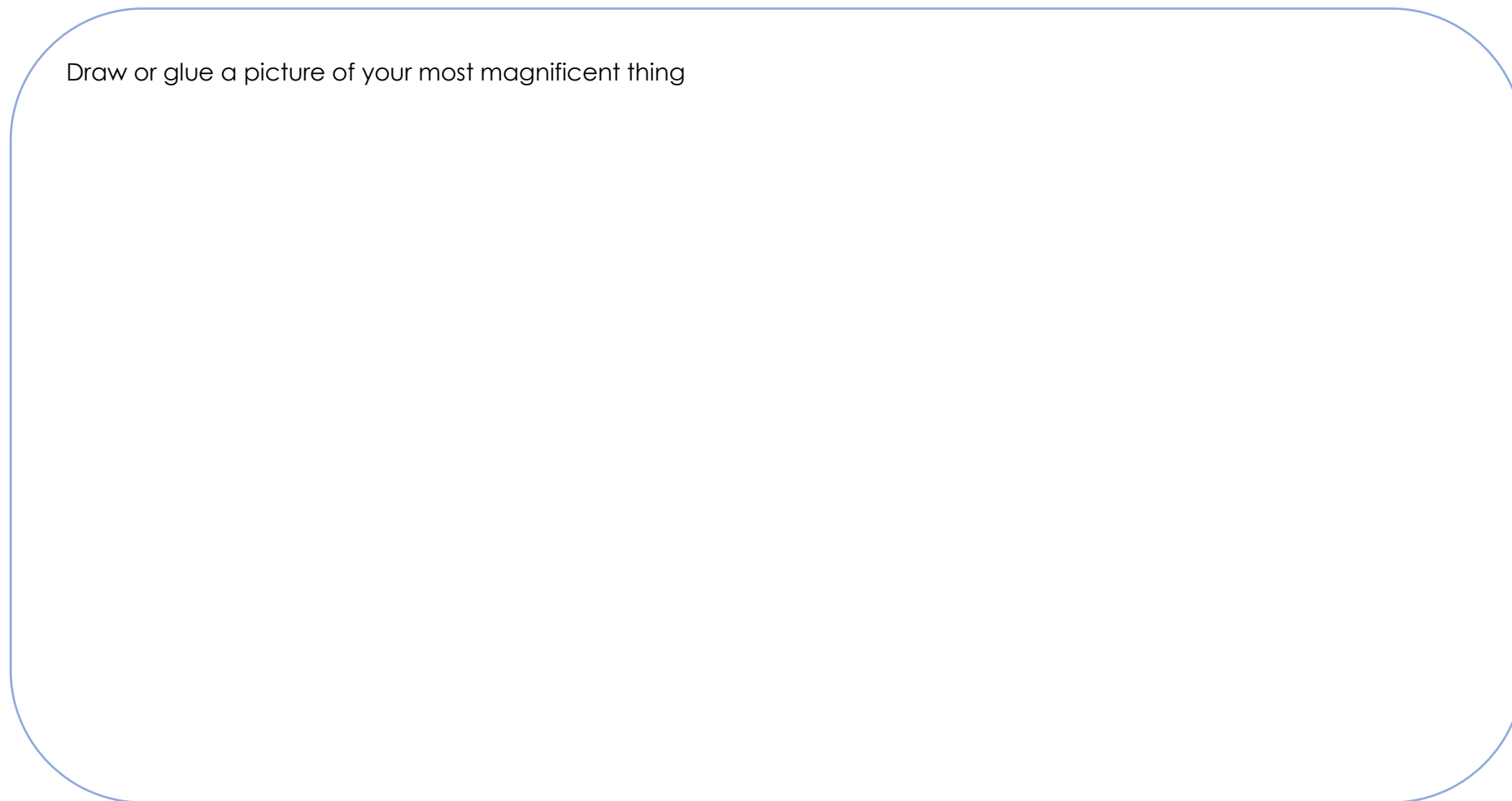
What is it made from?

What does it do?

Is it different to your plan?

Appendix 17B: Student activity sheet 4.1B: Analysis

Draw or glue a picture of your most magnificent thing





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