Sample assessment task	
Year level	3
Learning area	Technologies
Subject	Design and Technologies: Engineering principles and systems
Title of task	The leaning tower
Task details	
Description of task	The task gives students the opportunity to build a 'tower' out of non-traditional materials. The task is to produce a 'strong' tower using 'weak' materials. The final structure needs to hold a weight off the ground – the higher off the ground, the better. Students are required to work in groups of three to design and construct the tower; however, they need to individually produce a labelled drawing of the tower.
Type of assessment	Formative
Purpose of assessment	To assess students' understanding of the connection between forces, materials and the reaction, as well as students' design, planning and evaluation techniques.
Assessment strategy	Group activity *(groups of three for construction of tower)* Portfolios and work samples – written Observation *(teacher observes students working collaboratively)*
Evidence to be collected	Individual task booklets
Suggested time	3 x 1 hour lessons
Content description	
Content from the Western Australian Curriculum	***Knowledge and understanding*** **Engineering principles and systems** Forces, and the properties of materials, affect the behaviour of objects ***Processes and production skills*** **Designing** Develop and communicate ideas using labelled drawings and appropriate technical terms **Producing and implementing** Select, and safely use, appropriate components with given equipment to make a solution **Evaluating** Use criteria to evaluate design processes and solutions developed **Collaborating and managing** Work independently, or collaboratively when required, to plan, safely create and communicate sequenced steps

Task preparation	
Prior learning	Students have investigated various materials and the construction properties of them. They have an understanding that weak materials can be made stronger by arranging them in a particular way (such as triangles and cross bracing).
Assessment differentiation	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.
Assessment task	
Assessment conditions	• Individually draw a design for the tower based on prior knowledge. • As a whole class, revisit how materials can be made stronger (revision). View YouTube clips; review previous work samples in portfolios. • Students work in groups of three to construct the tower and complete the booklet individually.
Resources	**Individually:** • Task booklet **Examples of components for students to select from:** • Toothpicks, skewers, straws, rolled paper tubes • Blu tac, marshmallows, glue, tape, play dough, paper fasteners • Variety of different sized weights to test the tower (e.g. cans of food, small weights etc) • Camera

Instructions for teacher

The task is split into two – prior knowledge: lesson 1, giving students more information to allow success in the task; lesson 2, the task.
Students will design and construct a 'tower' out of materials they select that can ***elevate a weight*** above the ground. The heavier the weight, the higher it can be elevated and the longer the structure is able to hold it, the more successful the structure is.

Review prior knowledge (15 minutes)

Prior to lesson 1, show the students the construction materials they can choose from. Have them individually draw possible design solutions for making a 'tower' to hold a weight.

Task instructions

Lesson 1: 45 minutes

Revisit:

- the role engineers play in design and the process they undertake to design a structure (YouTube clip)
- basic principles of strong structures (web sites and YouTube clips as examples)
- view images of buildings, bridges, towers around the world and identify common elements in the construction e.g. shapes, bracing, materials used
- review initial design and mark any changes that could be made to improve it using the information they now have.

Lesson 2: 60–90 minutes

- Divide students into groups of three.
- Have them view each other's initial design solutions and discuss key elements in them.
- Together, they need to use their prior knowledge and individual design ideas to come up with a group design solution that they will construct together. They need to draw the design into their individual task booklets and explain why they chose that particular design.
- Students construct and test their structure determining its success against set criteria.

Any worksheets or scaffolding specific to the task

Leaning Tower – Task booklet

Instructions to students

Prior knowledge task

Draw initial design ideas for a tower, using your chosen materials. Label the design, including how you think the materials will behave.

Draw the final design to be constructed by your group and label it, including how you think the materials will behave when force is applied to it. Where will the weight go and what will make the structure stay up (e.g. include bracing ideas)?

Before beginning to make the tower, explain your group's choice of design. If you are combining a number of ideas from your group or viewed designs, why?

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

How successful was your group's tower?

1	The tower holds a _____**g** weight
2	The weight is _____**cm** off the ground.
3	The tower held the weight for _____**seconds** _____**minutes** ○ The tower held the weight indefinitely

Rate your tower's success and your group skills. *5 is excellent and 1 is unsuccessful.*

	EXCELLENT ⟷ **UNSUCCESSFUL**				
Design ideas included prior knowledge	**5**	**4**	**3**	**2**	**1**
The group's chosen design was easy to follow	**5**	**4**	**3**	**2**	**1**
The design included elements such as bracing	**5**	**4**	**3**	**2**	**1**
Labels included how the materials behaved	**5**	**4**	**3**	**2**	**1**
The tower held the weight! (it was successful)	**5**	**4**	**3**	**2**	**1**
Your group worked together to achieve the task	**5**	**4**	**3**	**2**	**1**

Explain why you think your group's tower was successful or unsuccessful. Did the materials behave as you expected?

_____
_____
_____
_____
_____
_____

Include a photo of your groups completed leaning tower holding a weight.

Sample marking key

Explanation:

- *For each question, there is a criterion-referenced marking key which shows the type of response expected in order for students to gain the full range of marks within each question.*
- *The "Answers could include" section gives a sample of the sort of response that could be expected and how the mark allocation is made.*

Description	Marks
Engineering principles and systems	
Demonstrates comprehensive understanding of the relationship between the force (weight) and the properties of the materials chosen (e.g. uses bracing in the construction and labels this in their drawing).	3
Demonstrates brief understanding of the relationship between the force (weight) and the materials used (e.g. attempts to use bracing or other kinds of strengthening to make the structure stronger).	2
Demonstrates limited understanding of the relationship between the force (weight) and the materials used (e.g. no bracing or strengthening included – tower collapses).	1
No engagement in the design process.	0
Subtotal	**3**

Answers could include, but are not limited to:

- sophisticated design including labelling
- evidence of prior knowledge included in the design (e.g. cross bracing, use of shapes)
- a photo of the completed tower is included.

Description	Marks
Designing	
Comprehensively explains the design choice and has clearly labelled drawings that draw on prior knowledge, and uses technical terms appropriately.	5–6
Briefly describes the design choice and attempts to label the drawing with limited connection to prior learning and minimal use of technical terms.	4–5
Provides a limited description of the design choice and the drawing is inappropriately labelled or not labelled at all and shows no connection to prior learning.	1–2
Does not communicate ideas and makes no attempt to complete any drawings.	0
Subtotal	**6**

Answers could include, but are not limited to:

- explains the design choice with detail
- evidence of prior knowledge in explanation
- includes technical terms in explanation of choice
- drawings are clear and easy to follow
- has detailed design drawings that are labelled
- evidence of prior knowledge in drawings.

Evaluating	
Description	**Marks**
Comprehensively evaluates design, using the rating scale and table to describe the tower's success, using evidence.	3
Briefly evaluates the design process, with limited evidence.	2
Has limited understanding of the design process and doesn't engage in the evaluation process.	1
Task not completed.	0
Answers could include, but are not limited to: • completes the criteria rating • completes the table, giving details • gives an explanation for success.	
Subtotal	**3**
Total	**12**

Working collaboratively as well as individually

Include as many lines as needed to include all students.

Teacher observation sheet				
Student names	Demonstrates *a* ***high level*** *of competence* when working collaboratively to plan steps for the design process and works individually to complete task **(3)**	Demonstrates ***consistent*** collaborative skills to plan steps for the design process work individually to complete task **(2)**	***Limited*** collaboration when working in a group to plan steps for the design process and has difficulty working individually without teacher support **(1)**	**Mark /3**