DIGITAL TECHNOLOGIES HUB

Design thinking in context: part 1

Years 5–6

Investigating and defining, Generating and designing, Producing and implementing, Evaluating

This sequence of three posters illustrates how to use an authentic context to design, implement and evaluate a solution. It shows how design thinking can be applied to the processes and productions skills in the Australian Curriculum: Technologies. The context provides an opportunity for students to produce a working model, applying their understanding of materials and engineering, and also implement the solution using visual programming.

CONTEXT: DESIGN, IMPLEMENT AND EVALUATE AN AUTOMATED CAT FEEDER

Design thinking (non-linear)

EMPATHISE
Understand the needs of the user in the context of the design challenge.

DEFINE
Define the challenge based on what you learned about the user.

IDEATE
Combine your understanding of the problem with creativity to generate ideas.

PROTOTYPE
Develop a basic example of your preferred design idea.

TEST
Review your prototype against design criteria and user story.

The Australian Curriculum: Processes and productions skills

DIGITAL TECHNOLOGIES

Achievement standard

Students develop and modify digital solutions and define problems and evaluate solutions using user stories and design criteria. They design algorithms involving complex branching and iteration and implement them as visual programs including variables.

Content descriptions

Investigating and defining
Define problems with given or co-developed design criteria and by creating user stories | AC9TDI6P01

Generating and designing
Design a user interface for a digital system | AC9TDI6P03
generate, modify, communicate and evaluate designs | AC9TDI6P04

Producing and implementing
Implement algorithms as visual programs involving control structures, variables and input | AC9TDI6P05

Evaluating
Evaluate existing and student solutions against the design criteria and user stories and their broader community impact | AC9TDI6P06

DESIGN AND TECHNOLOGIES

Achievement standard

Students select and justify design ideas and solutions against design criteria that include sustainability. They communicate design ideas to an audience using technical terms and graphical representation techniques. Students develop project plans, including production processes, and select technologies and techniques to safely produce designed solutions.

Content descriptions

Investigating and defining
Investigate needs or opportunities for designing, and the materials, components, tools, equipment and processes needed to create designed solutions | AC9TDE6P01

Generating and designing
Generate, iterate and communicate design ideas, decisions and processes using technical terms and graphical representation techniques, including using digital tools | AC9TDE6P02

Producing and implementing
Select and use suitable materials, components, tools, equipment and techniques to safely make designed solutions | AC9TDE6P03

Evaluating
Negotiate design criteria including sustainability to evaluate design ideas, processes and solutions | AC9TDE6P04

DIGITAL TECHNOLOGIES HUB

Design thinking in context: part 2

Years 5–6

Investigating and defining, Generating and designing, Producing and implementing, Evaluating

Applying design thinking to an authentic context
Design, implement and evaluate an automated cat feeder.

Investigating and defining

Students create a user story and define the problem using given or co-created design criteria which state the requirements a solution must meet to solve a problem effectively.

The design criteria for an automated cat feeding system might include the following.

The cat feeder must:

- operate automatically
- provide an amount of food at a set time
- have a backup if something goes wrong.

EMPATHISE

A user story helps to understand the problem and empathise with the user. Discuss the components of a user story such as:

- A <type of user> has <a goal> so that < reason for the goal>.

I want **<a way to feed my cat while I'm away from home>**

so that **<I can ensure my cat is fed on time and the right amount>.**

Role **<cat owner>**

DEFINE

Use the 5Ws (who, what, when, where, why) questions routine to guide students to write the problem statement.

PROBLEM STATEMENT: Enter the problem statement here...

WHO	WHAT	WHEN?	WHERE?	WHY?
Who is the problem affecting?	What is the unmet need?	When is the problem happening?	Where is the problem occuring?	Why is this worth solving?

Problem statement: The cat owner needs a reliable, automated way to ensure their cat is fed the correct amount of food at the right time while they are away.

Generating and designing

Encourage students to generate multiple designs and judge them against design criteria and user stories. Modify and refine the preferred design idea if it does not satisfy all the requirements.

The preferred design should show the idea clearly, highlighting important features and how it works, while also showing who it's for and how it solves a problem.

IDEATE

Brainstorming is a common method of ideation. Start with a core idea and branch out. For example, for the automated cat feeder:

- **Timing:** How often will food be dispensed?
- **Portion size:** How much food will be dispensed?
- **Sensors:** Will it detect if the bowl is empty?
- **Connectivity:** Will it use an app for remote feeding?

Encourage rapid sketching of ideas. Visualise multiple ways to design each key function or component based on the core ideas. Avoid judgment and prioritise creativity. Combine elements from the generated designs to develop a preferred solution.

PROTOTYPE

The prototype of the preferred design idea can be in the form of a sketch, flowchart or simple model.

A **sketch** shows the key parts and how they work together.

A **flowchart** describes the sequence of steps with decisions.

A **simple model** uses readily available materials such as cardboard, plastic containers and masking tape.

TEST

Use the prototype to review and check the preferred design against the user story and design criteria to ensure it meets the design requirements. If elements do not satisfy the design requirements revisit ideation stage.

DIGITAL TECHNOLOGIES HUB

Design thinking in context: part 3

Years 5–6

Investigating and defining, Generating and designing, Producing and implementing, Evaluating

Applying design thinking to an authentic context
Design, implement and evaluate an automated cat feeder.

Producing and implementing

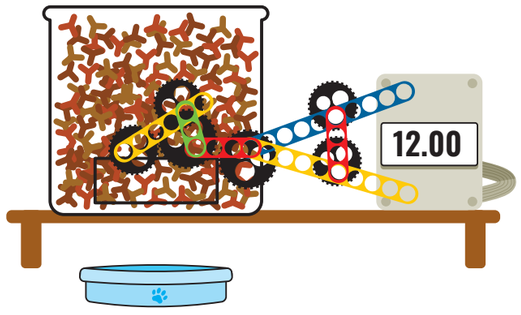
The preferred design idea is implemented and developed into a solution.

In Years 5–6, digital solutions are created as visual programs by coding a set of steps, decisions and repetitions (algorithms). These programs establish sequence, branching and iteration, and include variables ensuring logical flow and decision-making.

Examples of implementing a digital solution:

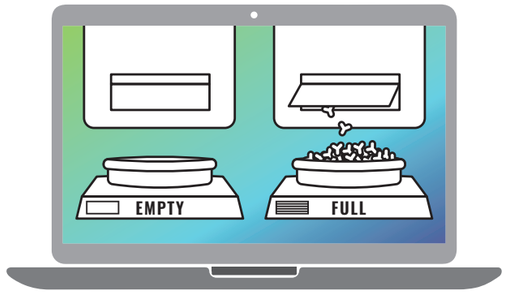
Gravity-fed dispenser

Program the motor to open the flap and release a fixed amount of food after a specified duration using a timing loop.



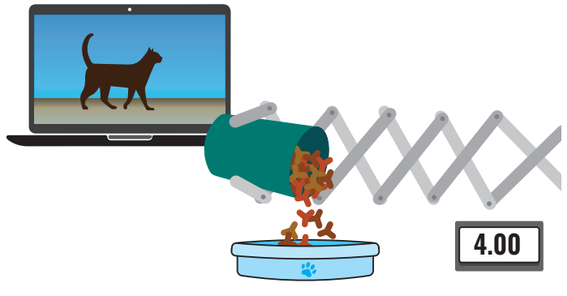
Weight-sensitive dispenser

Simulate the weight sensor input in Scratch and program it to release food when the 'weight' variable meets a certain condition.



Webcam sensor

Train an AI to recognise the cat. A web camera detects the cat and a Scratch program decides to feed the cat depending on how long it has been since the cat has been fed.

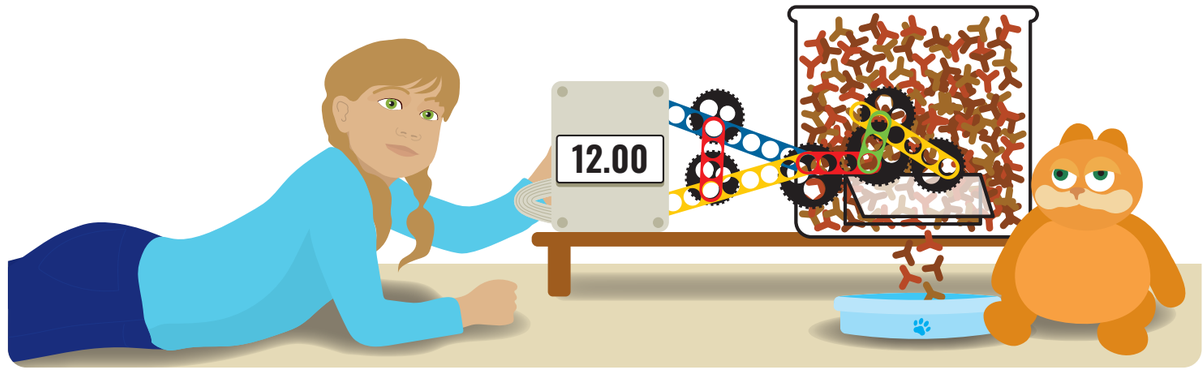


App: smart device

Connect a dispenser to a simple app, allowing the cat owner to dispense food with voice commands. Use Scratch or App Designer to simulate the interface.

Evaluating

Students evaluate the effectiveness of their solution. How well does it address the design criteria and meet the needs identified in the user story? They reflect on the wider community and consider any potential impacts of their solution.



Student reflection

Students present their solutions and explain how they meet the design criteria. Use questions such as these to guide the process:

- How does your solution **automatically feed the cat**?
- How does your solution **measure and dispense the right amount of food and timing**?
- What happens if there's a **technical failure**? What is the backup plan?

Students assign themselves a satisfaction rating, like a 5-star scale, reflecting what they believe the cat owner would give their solution, and provide a justification for their rating.

Personal and community impacts

Students reflect on potential impacts of their solution.

POSITIVE	NEGATIVE
Community impact: Well-fed and contained cats decrease impact on wildlife.	**Sustainability:** The solution requires non-recyclable materials and consumes energy.