DIGITAL TECHNOLOGIES HUB

Design thinking in context: part 1

Years 3–4

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 ALARM SYSTEM

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 creativity and your understanding of the problem to generate ideas for the design challenge.

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 create simple digital solutions and use provided design criteria to check if solutions meet user needs.

Content descriptions

Investigating and defining

Define problems with given design criteria and by co-creating user stories | AC9TDI4P01

Generating and designing

Generate, communicate and compare designs | AC9TDI4P03

Follow and describe algorithms involving sequencing, comparison operators (branching) and iteration | AC9TDI4P02

Producing and implementing

Implement simple algorithms as visual programs involving control structures and input | AC9TDI4P04

Evaluating

Discuss how existing and student solutions satisfy the design criteria and user stories | AC9TDI4P05

DESIGN AND TECHNOLOGIES

Achievement standard

Students select design ideas against design criteria. They communicate design ideas using models and drawings including annotations and symbols. Students plan and sequence steps and use technologies and techniques to safely produce designed solutions.

Content descriptions

Investigating and defining

Explore needs or opportunities for designing, and test materials, components, tools, equipment and processes needed to create designed solutions | AC9TDE4P01

Generating and designing

Generate and communicate design ideas and decisions using appropriate attributions, technical terms and graphical representation techniques, including using digital tools | AC9TDE4P02

Producing and implementing

Select and use materials, components, tools, equipment and techniques to safely make designed solutions | AC9TDE4P03

Evaluating

Use given or co-developed design criteria including sustainability to evaluate design ideas and solutions | AC9TDE4P04

DIGITAL TECHNOLOGIES HUB

Design thinking in context: part 2

Years 3–4

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

Applying design thinking to an authentic context
Design, implement and evaluate an alarm system.

Investigating and defining

Co-create a user story to understand the user and their needs. Provide the design criteria which state the requirements a solution must meet to solve a problem effectively. Use these criteria to define the problem or design challenge.

An example of design criteria for the alarm system:

- The alarm must have a clear method for detecting the event.
- The alarm must provide a clear alert when triggered.
- The system should have a way to reset the alarm.
- The system should be easy to operate.

EMPATHISE

The teacher co-creates a user story with the students.

For a temperature-triggered alarm the user story might look like this:

As a: teacher

I want to: have a temperature alarm system in the classroom that alerts me if the temperature becomes too high or too low.

So that I can: ensure a comfortable learning environment for students and address any issues with the classroom climate promptly.

Work though user stories for other examples, such as a home owner who wants an alarm for home safety, to identify their needs, and why it is important.

DEFINE

Use a problem statement template that uses 5Ws (who, what, when, where, why) questions to explore an identified problem. Clearly define the problem.
For example, 'How do I know when the temperature in the classroom needs adjusting so the students are more comfortable when learning?'

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?

Generating and designing

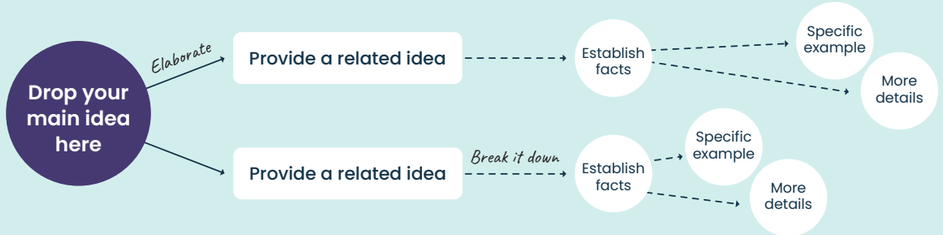
Encourage students to generate multiple designs and compare their designs.

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

Students start by exploring all the different ways they could solve this problem. Think about the needs of the user and imagine as many possibilities as they can. At this stage don't judge the design idea.

Use mind maps, for example, to organise and expand on the ideas generated.



PROTOTYPE

Sketches: Sketch out their ideas to highlight how their alarm system works.

Role-playing: Use role-playing to simulate the idea and see how it might work in practice.

Simple models: Create physical or digital models of the proposed design.

TEST

At this level, students compare their design ideas with each other, checking if the user needs are met.

DIGITAL TECHNOLOGIES HUB

Design thinking in context: part 3

Years 3–4

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

Applying design thinking to an authentic context
Design, implement and evaluate alarm system.

Producing and implementing

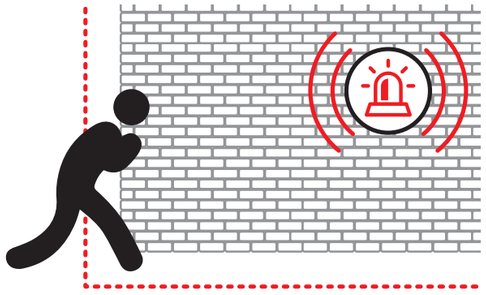
The preferred design idea is implemented and developed into a solution.

In Years 3–4, digital solutions are created as visual programs by coding a set of steps, decisions and repetitions (algorithms). These programs establish sequence, branching and iteration, ensuring logical flow and decision-making.

Examples of implementing a digital solution:

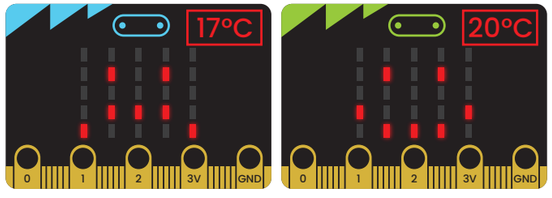
Motion detection alarm

A scratch program that simulates motion detection. When a sprite touches a colour that identifies a restricted zone of the yard, the alarm sounds and alerts the homeowner.



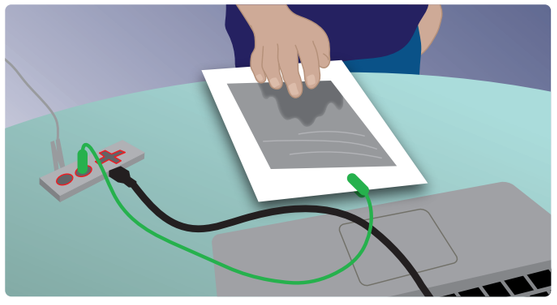
Temperature-triggered alarm

Use a micro:bit to create a program that uses the temperature sensor. If the temperature is less than 18°C then play the tone Middle C for 5 sec and show unhappy face icon. If the temperature is more than 22°C play the tone High F for 5 sec and show unhappy face icon. If not, show happy face icon.



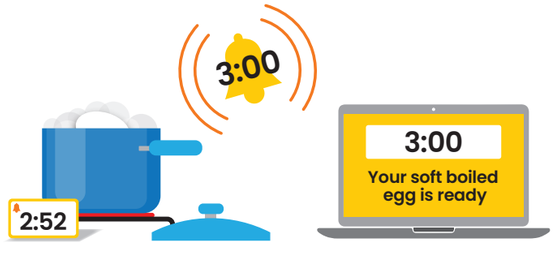
A touch pad

A scratch program that incorporates a Makey Makey connected to an aluminium foil touch pad that when activated sounds an alarm. The alarm sounds until the homeowner hits the stop button.



A timer

A program created in Scratch that provides the home cook with an alarm to ensure they have the perfectly cooked egg. The program uses the sensor blocks for time and reset time. An alert will sound for 10 seconds at different times to indicate a soft, medium or hard-boiled egg.



Evaluating

Once a solution has been implemented, refer to the user story and design criteria to see how well the solution meets the user needs.

Use a checklist that incorporates the design criteria, for example:

- ☑ The alarm has a clear method for detecting the event.
- ☑ The alarm provides a clear alert when triggered.
- ☑ The system has a way to reset the alarm.
- ☑ The system is easy to operate.

Refer to the user story, how well does it meet the user's needs?

User story: Motion-activated home security alarm

As a: homeowner

I want to: have an alarm system that alerts me when someone enters a restricted area in my home.

So that I can: ensure my home is secure and receive immediate notification of any unauthorised access.