



CLASSROOM IDEAS: YEARS F–2

Understanding algorithms and the smiley face biscuit challenge

Morning routine



Figure 1: An example of a morning routine chart, made using symbols. Routines can be used to teach very young students about the importance of order and sequencing.



Figure 2: A visual algorithm that demonstrates the life cycle of a frog, created using hand-painted rocks



Figure 3: An illustration of the CS Unplugged kidbot algorithm activity. Source <https://csunplugged.org/en/topics/kidbots/unit-plan/rescue-mission/> CC BY-SA 4.0

Algorithms are a key concept in Digital Technologies and fundamental in computational thinking (poster available – see Useful links.) They help us follow, describe and represent a sequence of steps and decisions needed to solve simple problems (ACTDIP004). We use them every day, often in the form of procedures that can be easily repeated. Getting ready for school in the morning using a routine (Figure 1), the process of moving into or out of class and task instructions given by a teacher are all algorithms.

Algorithms can be expressed in many ways, for example as text, in timeline or flowchart form or demonstrated through an ordered sequence of images (Figure 2). They can even be mimed or acted out. In F–6 Digital Technologies, algorithms can be created in block code (visual programming language). To learn about algorithms, F–2 students could:

- discuss the sequence of steps needed to understand how to play a simple game. What is the purpose of rules in a game?
- sequence words or images that describe the order of events in a story or procedural text.
- create their own algorithm for a classmate to follow. For example, a sequence for a human robot to follow (Figure 3) or dance moves to perform using images or symbols as visual steps.
- create an algorithm in visual programming language to control a device such as a robot (Figure 4).
- order a sequence of visual cards to create an algorithm and then carry it out. The smiley face biscuit challenge (Figure 5) is one such activity. Students will need to use computational thinking to order the images and create an algorithm. They could then use the algorithm to make the biscuits. Students could then consider if the algorithm is detailed enough so that a group of finished biscuits look the same. If not, how could it be modified or improved?

Links to the Australian Curriculum

Table 1: Aspects of the Australian Curriculum: Digital Technologies F–2 which may be addressed depending upon the task.

Digital Technologies	By the end of Year 2, students identify how common digital systems (hardware and software) are used to meet specific purposes. They use digital systems to represent simple patterns in data in different ways.		
Achievement standard	Students design solutions to simple problems using a sequence of steps and decisions . They collect familiar data and display them to convey meaning. They create and organise ideas and information using information systems and share information in safe online environments.		
Strands	Digital Technologies processes and production skills <ul style="list-style-type: none"> • Creating designed solutions by: <ul style="list-style-type: none"> – Investigating and defining 		
Content descriptions	<ul style="list-style-type: none"> • Follow, describe and represent a sequence of steps and decisions (algorithms) needed to solve simple problems (ACTDIP004) 		
Key concepts	<ul style="list-style-type: none"> • abstraction • algorithms 	Key ideas	Thinking in Technologies <ul style="list-style-type: none"> • computational thinking
Cross-curriculum priorities		General capabilities	<ul style="list-style-type: none"> • Literacy • Numeracy

Safety considerations: In implementing projects with a focus on food, care must be taken with regard to food safety and specific food allergies that may result in anaphylactic reactions. The Australasian Society of Clinical Immunology and Allergy has published guidelines for prevention of anaphylaxis in schools, preschools and childcare. Some states and territories have their own specific guidelines that should be followed. For further information about relevant guidelines, contact your state or territory curriculum authority. Ref: <https://www.australiancurriculum.edu.au/resources/curriculum-connections/portfolios/food-and-wellbeing/>

Useful links

- Australian Computing Academy (ACA) Unpack the curriculum – Algorithms <https://aca.edu.au/curriculum/algorithms/>
- ACARA Digital Technologies in focus project resources <https://www.australiancurriculum.edu.au/resources/digital-technologies-in-focus/resources/>
- ACARA Digital Technologies in focus project computational thinking poster https://www.australiancurriculum.edu.au/media/5013/computational-thinking_poster_v3.pdf
- Bebras UK downloadable computational thinking challenge cards <http://www.bebas.uk/uploads/2/1/8/6/21861082/uk-bebras-cards.pdf>
- Computer Science (CS) Unplugged activities <https://classic.csunplugged.org/activities/>
- CS Unplugged – Rescue mission activity (Figure 3) <https://csunplugged.org/en/topics/kidbots/unit-plan/rescue-mission/>
- Digital Technologies Hub – search resources using the term ‘algorithms’ <https://www.digitaltechnologieshub.edu.au/>
- Digital Technologies Hub – Buzzing with Bee-Bots activity <https://www.digitaltechnologieshub.edu.au/teachers/lesson-ideas/buzzing-with-bee-bots>
- Digital Technologies Hub – What’s the buzz? (Bee-Bot) activity <https://www.digitaltechnologieshub.edu.au/teachers/lesson-ideas/what's-the-buzz>



Figure 4: An example of visual programming language (block code) created in Scratch 3.0

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The smiley face biscuit challenge

Begin and end the activity with a discussion. Compare the finished biscuits before they are eaten. Why are they not all the same? How could we change the algorithm to make sure they are?

Smiley face biscuits visual algorithm cards

Instructions:

1. Cut these cards out.
2. Ask students to organise them into the correct sequence needed to make a smiley face biscuit.
3. Ask students to make the biscuits by following the algorithm.
4. Compare finished biscuits. Are they all the same? Why or why not?



Figure 5: Smiley face biscuit visual algorithm cards