Algorithms: Ngarrindjeri weaving

*Please refer to the online lesson plan on the DT Hub to access all website links and additional resources.*

**Years 3–4** In this lesson, students will practise breaking down a process into smaller parts or steps as an introduction to computational thinking. They will practise following and giving accurate instructions, identifying errors, and iterating their instructions to improve clarity of information.

# Language note

We have chosen to use the terms Aboriginal and Torres Strait Islander and First Nations Australian throughout this document to align with the language used in version 9.0 of the Australian curriculum. We have also used First Nations Traditional Owners as this was Tania’s preference. We acknowledge that this may not be the preferred term for the First Nations Peoples where your school resides. Educators and Leaders are encouraged to engage with First Nations traditional owners of the land you reside to clarify preferred language.

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# About the authors

**Tania Taylor**

Tania Taylor is a proud Kaurna, Narrunga and Ngadjuri woman with nearly 20 years experience in community development and engagement, mentoring, education support, program design and strategic planning. She has served her community as an active board member of the Kaurna Yerta Aboriginal Corporation for eight years. Tania’s knowledge and experience includes working with Aboriginal communities in metropolitan, in a range of settings level across Australia.

**Kim Martin**

Kim Martin is an accomplished educator, with expertise in inclusive learning technologies. She has held various teaching and leadership roles in the education sector, non-profit organisations and education technology companies across South Australia. Kim's commitment to education through technology is exemplified by her accolades, including 2014 ACCE Educator of the Year, and recent recognition as the 2023 EdTechSA Leader of the Year. Her passion lies in harnessing technology to facilitate differentiated learning experiences enabling learners to demonstrate their knowledge and understanding. Kim is a non-Aboriginal collaborator.

# Why this is relevant

An algorithm describes a sequence of steps and decisions to achieve a desired outcome. While some students at this level may be recording their algorithms as spoken instructions, a written list or as a series of images, they start to consider how to formulate their algorithms in a form the intended user will be able to interpret easily and accurately. For students ready for the next step, they will practise recording an algorithm using a flowchart. A flowchart is a graphical representation of the steps a program takes to process information.

Students learn to describe, follow and represent an algorithm by following instructions given by someone else, then practise giving their own instructions. They learn computational thinking skills by having multiple opportunities to break down a problem into smaller parts or steps.

# Engaging with Aboriginal and Torres Strait Islander communities

## Protocols for engaging with Aboriginal and Torres Strait Islander communities

Consider inviting an Aboriginal or Torres Strait Islander community member to your class. They can share insights and experiences of travelling to visit family on Country from their perspective. When approaching community members, including Elders, please be mindful that not all possess knowledge relevant to your learning outcomes. As individuals, just like everyone else, they have diverse specialties and interests. It cannot be assumed that they have the authorisation or a willingness to share their knowledge.

In the learning environment, fostering positive experiences with Aboriginal Peoples and Torres Strait Islander Peoples is crucial for promoting attitudinal change and building respectful relationships. Inviting active involvement of Aboriginal and Torres Strait Islander Peoples in all stages of your program development by employing them as guides and experts, not just guest speakers, can provide valuable learning experiences that enrich your and students’ knowledge and awareness beyond the individual lesson shared here. Before you invite guests from Aboriginal or Torres Strait Islander communities to your school, first seek out information about proffered protocols for engaging with Aboriginal or Torres Strait Islander Peoples on your Country. Local government websites often have guiding information to help you. Common considerations include the negotiation of dates, time and duration, and payment rates well in advance, and ensuring that the visitor has transport arrangements.

We recommend referring to your state or territory education governing body for context and guidelines regarding culturally respectful practices. Here are a few links to get your started.

* SBS: Aboriginal and Torres Strait Islander Protocols Guide – for Teachers
* Culture is Life: Teaching First Nations Knowledges & Perspectives
* Beyond Blue | Be You: Culturally respectful engagement for learning communities

## Cultural safety

Every child has a right to feel safe at school. Creating safe conditions for learning involves providing supported yet challenging environments to enable high-quality learning opportunities. Cultural safety, defined in Williams (1999) as an environment that is spiritually, socially and emotionally secure, is crucial. It encompasses shared respect, meaning and knowledge; and the experience of learning together with dignity. In classrooms, recognising the diverse life experiences and knowledges of Aboriginal and Torres Strait Islander children is essential, acknowledging that each student's connection to and understanding of their histories and cultures varies. Caution is advised when requesting students to share information, as they may not possess the knowledge, permission or comfort to do so, causing cultural load for the student. In interactions involving First Nation Australian historical and cultural contexts, establish ground rules for respectful discussions and behaviours, considering the complexity and sensitivity of each student's identity and cultural connection.

Reference

Williams, R. (1999). Cultural safety: What does it mean for our work practice? *Australian and New Zealand Journal of Public Health*, 23(2), 213–214*.* [*https://doi.org/10.1111/j.1467-842X.1999.tb01240.x*](https://doi.org/10.1111/j.1467-842X.1999.tb01240.x)

## Indigenous Cultural and Intellectual Property

‘Indigenous Cultural and Intellectual Property [ICIP]refers to the rights that Indigenous people have, and want to have, to protect their traditional arts and culture’ (Arts Law Centre of Australia).

The lesson ideas and discussion prompts are designed to support teachers in facilitating learning opportunities that help students’ understanding of First Nation Australian ways of knowledge and perspectives within the curriculum area of Technologies, specifically the Digital Technologies subject. We see many opportunities for integrated learning across all learning areas including English, Mathematics, Arts, and Humanities and Social Sciences (HASS).

Learn more: *ICIP information sheet*

# Learning hook

* Refer to the slides Algorithms: story maps (PowerPoint) to guide the lesson.
* Discuss procedures you do regularly, as an individual and as a family. For example, as an individual, tying your shoelaces or brushing your teeth. As a family, it might be cooking or sharing a meal together or a movie night at home, a weekend bike ride or playing a game. Ask students: Could you write down all the steps for one of these tasks if you needed to?
* Share the video: Ellen Trevorrow Ngarrindjeri weaving – everything is connected (7 minutes) featuring Ellen Trevorrow (Auntie Ellen).
* Discuss what a procedure is. Why might it be important to Ellen and her community to continue this process? Where or when does the process start? For example, is it when they all get in the car to collect the plant materials or is it when they start weaving together?

## Learning map and outcomes

### Learning intentions

Students will:

* explore how to create a set of directional instructions in the form of a flowchart.
* transfer details of a story shared with them into a flowchart that makes sense to them.

### Success criteria

Students can:

* recall details of a procedure that is shared in the form of a story.
* create a flowchart to record the main elements of a story.
* compare and iterate their flowchart with peers to improve the detail or structure or both.

# Learning input

* Model a flowchart with the class using an everyday experience the class will all be familiar with. Allow for discussion and iteration of the flowchart based on the class discussion. For example, brushing your teeth or getting ready for bed. View an example from the CSER Digital Technologies MOOC.
* Discuss if colours or shapes might make it easier to read the flowchart. For example, if the start and stop steps were the same colour or shape, or could arrows improve understanding for the end user? Add in some of the students’ feedback.
* Discuss reasons for including or excluding the whole morning routine before school. For example, each family do things differently: what time they get up, when and what they have for breakfast, how they get to school and who packs the lunches. The flowchart would be very complicated with options. This one specific task can be isolated and easily transferred to a flowchart for everyone.
* Discuss different elements of the flowchart. For example, start, stop, choices and decisions, direction or flow of the chart and actions to be carried out.
* As a class, agree on any constants for everyone’s flowcharts. For example, will the start and stop be a certain colour or shape for everyone’s flowchart?

# Learning construction

Give students an opportunity to create their own flowchart based on the Ngarrindjeri weaving video. (Allow about 20 minutes)

* View the video again and this time ask students to record the steps in the weaving process. Students can record the steps in a way that will help them remember and recall the steps. For example, this could be with words, images or symbols or a combination.
* Consider sharing the video link with students so that individuals can view and rewind the video as many times as they need to gather the information they feel is important to capture.
* Students then have a go at transferring their procedure notes to a flowchart. This can be done using A3 or A4 paper and pencils or a word processing program with SmartArt options, such as Microsoft Word, Google Docs or Apple Pages.

# Learning demo

* Ask students to share their flowchart with a peer (pairs) and compare differences and similarities. (10 minutes: 5 minutes each person)
* Provide an opportunity for students to iterate and improve their flowchart after discussing and sharing with a peer. (5–10 minutes)
* Students share their flowchart in a second round of pairs and discuss things they improved or would do differently next time to improve readability or flow.

# Learning reflection

* Whole class discussion about the process of sharing, comparing and being given an opportunity to iterate and improve their flowchart. Discuss what information is still missing or needed to successfully use this flowchart to start learning to weave like the Ngarrindjeri women in the video. For example, cultural knowledge and expertise, practical support and the right environment.
* Just because you know the steps, doesn’t make you an instant expert. Cultural knowledge and Aboriginal ways of knowing and doing are important for this task.
* What other types of tasks might an algorithm or flowchart be helpful for? For example, teaching a grandparent how to set the clock on the microwave. Finally, connect the process of creating a flowchart to algorithms and computational thinking by or have a discussion about how machine learning might use flowcharts to learn new tasks and processes for handling data or information.
* View this code.org video if your class could benefit from extra information about algorithms a Code.org video explaining algorithms

# Teacher cultural competencies

* In the video Ellen hints at something in her past that means she missed out on learning weaving skills ('I missed out as a child' at ~5:15) but there doesn't seem to be any elaboration or background given. Warning: considerations before facilitating deeper conversations into why Auntie Ellen’s family may have lost these skills, and the impact of colonisation may require discussion about the Stolen Generations.
* While weaving is a common practice among many Aboriginal and Torres Stra it Islander Nations, there were and still are different protocols and purposes, depending on the environment and needs of the community. Aboriginal and Torres Strait Islander weaving practices are intrinsically linked to the local environment and items are made from local materials. For example, on Ngarrindjeri Country, the women of the community have been carrying out the weaving, which includes baskets for gathering food supplies and pieces to be worn for ceremonies. For the Burarra and Gidjingali Peoples in Arnhem Land, Northern Territory, both the men and women have been participating in weaving, with the men often making fish traps and fishing nets, for example. Therefore, if you are going to localise this content for the Country where your school is situated, it is important to find out specifically about the uses of weaving in the specific First Nations community where you are. Asking Elders is a good place to start to gather this information.
* Aboriginal and Torres Strait Islander community members, including Elders, do not hold knowledge on all topics. You will need to be specific about your lesson or unit goals and the First Nations knowledges and perspectives you are interested in focusing on with the support of the community member to ensure you develop a reciprocal relationship with someone who has the knowledge and experience to support your program.

# Differentiation

* Extend students’ knowledge of flowcharts and programming-specific language. View this video about flowcharts from CSER MOOC aimed at teachers to get you started.
* Research the spiny-headed sedge (*Cyperus gymnocaulos*) used for weaving by Ngarrindjeri people and find out where it grows. Does it or did it once grow in the area where your school is located?
* Investigate what other plants and technologies are used by Ngarrindjeri people in daily life.
* Research whether weaving has been an activity carried out by women of the First Nations Australians where you live, play and learn. If it was, did they use the same plant or a different plant?
* Compare the traditional weaving to contemporary First Nations Australian artists’ weaving.
* Record an instructional video with the steps to a procedure or skill you do regularly. For example, how to do a basketball trick or how to feed your pet.
* Have a go at creating a flowchart for an algorithm of a process that you are familiar with. For further guidance view a flowchart lesson resource from the Digital Technologies Hub that includes a video.

# Resources

A4 or A3 paper and pencils or word processing application with SmartArt shapes tool, such as Microsoft Word, Google Docs or Apple Pages

* Slides: Algorithms: story maps
* Beyond Boundaries: Yvonne Koolmatrie: Practicing Culture
* Real-life algorithms: planting a seed Code.org video (2 min)
* Contemporary First Nations weaving: Unpacking the importance of First Nations weaving practices to Australian fashion
* CSER MOOC: Algorithm flowchart example
* CSER MOOC: An overview of flowcharts video (4 min)
* Digital Technologies Hub: Have fun with flowcharts lesson ideas
* Ellen Trevorrow Ngarrindjeri weaving – everything is connected video (7 min)
* NAIDOC Week: the art of traditional weaving (Birpai Country) video (2.5 min)
* Ngarrindjeri Culture: Ellen Trevorrow
* This Place: artist series: Yvonne Koolmatrie video (4 min)
* University of Melbourne Indigenous Knowledge Institute: Weaving design into local materials
* Yarn: the significance of traditional Indigenous fibre crafts
* Yvonne Koolmatrie: eel traps and sister baskets at the Art Gallery of South Australia

# Australian Curriculum

## Digital Technologies

Achievement standard

By the end of Year 4, students follow and describe simple algorithms involving branching and iteration and implement them as visual programs.

### Content descriptions

**Years 3–4**

* Follow and describe algorithms involving sequencing, comparison operators (branching) and iteration (AC9TDI4P02)
* Generate, communicate and compare designs (AC9TDI4P03)

## Related content

**HASS Year 4**

* The effects of contact with other people on First Nations Australians and their Countries/Places following the arrival of the First Fleet and how this was viewed by First Nations Australians as an invasion (AC9HS4K04)

**Science Year 4**

* Examine the properties of natural and made materials including fibres, metals, glass and plastics and consider how these properties influence their use (AC9S4U04)

## Cross-curriculum priorities

**Aboriginal and Torres Strait Islander Histories and Cultures: Country/Place**

The occupation and colonisation of Australia by the British, under the now overturned doctrine of terra nullius, were experienced by First Nations Australians as an invasion that denied their occupation of, and connection to, Country/Place. (A\_TSICP2)

**Aboriginal and Torres Strait Islander Histories and Cultures: Culture**

First Nations Australians’ ways of life reflect unique ways of being, knowing, thinking and doing (A\_TSIC2).

The significant and ongoing contributions of First Nations Australians and their histories and cultures are acknowledged locally, nationally and globally. (A\_TSIP3)

## General capabilities

**Intercultural Understanding**

Engaging with cultural and linguistic diversity