DTiF
Digital Technologies in focus
Initiative of and funded by the Australian Government Department of Education and Training

acara AUSTRALIAN CURRICULUM, ASSESSMENT AND REPORTING AUTHORITY

CLASSROOM IDEAS: YEARS 3–6

Exploring Digital Technologies through shopping

Figure 1: Why might supermarket shelf labels include barcodes? Source: https://pixabay.com/photos/cheese-refrigerator-processed-dairy-2725235/

Figure 2: A supermarket checkout

Figure 3: Receipt for groceries. Source: https://pixabay.com/photos/shopping-spending-till-slip-879498/

Students and their families use digital systems and Digital Technologies concepts in everyday shopping tasks. Through activities related to the shopping experience, students can participate in guided investigations to explore digital systems, data, algorithms and digital technologies.

Digital systems are made up of hardware and software components that receive data input, process and store data, and output data in some way. They are all around us in the form of computers, smart phones, smart TVs and digital ticket readers. In a supermarket there are many digital systems in use every day (e.g. Figures 1 and 2). Consider the following activities to help students identify these digital systems.

Students could:

- brainstorm: What is a digital system?
- visit a store with a caregiver or teacher to identify and record any digital displays they notice. Then consider: Do all digital systems have a digital display? What data are these displays telling the viewer? Students could collect their data (with appropriate store permission) using checklists, drawings, photographs or audio recordings.
  - identify and clarify information and ideas (CCTLC)
- create a class picture glossary of the digital system (see sample, page 6). The language associated with digital systems may be new to some students. This activity will help all students:
  - navigate, read and view learning area texts (LLC)
  - interpret and analyse learning area texts (LLC)
  - understand learning area vocabulary (LLC)
  - identify and clarify information and ideas (CCTLC)
  - organise and process information components (CCTLC) they may find in the local supermarket or at home. (Students could bring in cut off parts of packaging.)

CCTLC – Australian Curriculum: Critical and creative thinking learning continuum www.australiancurriculum.edu.au/f-10-curriculum/general-capabilities/critical-and-creative-thinking/

LLC – Australian Curriculum: Literacy learning continuum www.australiancurriculum.edu.au/f-10-curriculum/general-capabilities/literacy/

- use a choice of medium (drawing, writing, modelling, audio) to demonstrate how they think a digital checkout (Figure 2) works
- find a receipt from when someone last did their groceries (Figure 3) and from the receipt identify what data the digital system has provided to the consumer
- complete a PMI chart on the impact store-based digital systems could have on peoples' lives. The collection of this information could be used as a linking activity to the next concept of 'data'. Students may also realise that what some shoppers see as a plus, others see as a minus. The PMI chart could include:
  - time spent in lines or waiting for sales assistants
  - comparing spending patterns
  - accessing extra information about products
  - not needing to carry money
  - ordering food on interactive windows (kiosk)
  - virtual showrooms
  - decrease in customer service/less interaction with people
  - predictive analytics
  - facial recognition – to battle crime
  - in-store wi-fi
  - digital systems in store connecting with social media online, as seen in this example: https://mashable.com/2012/05/08/hangers-update-facebook-likes/#FX4u4iMxvOqm

Data is the information collected by digital technologies. Data may include characters (letters, numbers, symbols), images or sounds. These types of data can be stored and communicated by digital systems.

- ***Data collection*** – students gather different types of data in different ways; for example, by observing, counting and measuring
- ***Data representation*** – students start to notice patterns in the data, make predictions and explain how they can be represented in different ways; for example, five vs 5 vs IIIII vs 𝍸
- ***Data interpretation*** – students answer simple questions by grouping, classifying and revealing patterns. During this time they often make predictions about what they are observing.

Students could:

- brainstorm: What is data? (For some students this could also be used as a classification activity.)
- investigate:
  - what data are collected in a retail setting. How are data stored in a retail setting?
  - why the shopkeeper might be interested in the data collected by the digital systems in their store. The data might include: retail data, supplier data, market data, shopper data.
  - who might be interested in the data collected by the digital systems in a store, and what data might they collect?
  - if different data are collected if the product is purchased online rather than from a store
  - what data can tell us about the way we and other people shop.
- investigate in what ways data collected through digital systems in stores could be represented. Provide students with samples of data collected by digital systems in stores and have them identify how these data may be used by different groups of people; for example, shoppers, retailers, customers, suppliers, advertisers.
- consider data interpretation: What do the data tell us?
- investigate what kind of data can be found on a shopping docket, and consider: How do these data help the shop? How do these data help us as consumers?

Suggested activity: Give students a collection of dockets from a variety of stores and tell them that they are from a mystery shopper. Have the class try to profile the mystery shopper based on their shopping patterns. Consider including some receipts that may cause cognitive conflict; for example, a receipt for 12 Hot Wheels cars may indicate the purchaser is a child or an adult collector.

Algorithms are a key concept in Digital Technologies and fundamental in computational thinking. They help us follow, describe and represent a sequence of steps and decisions needed to solve simple problems. We can use algorithms to describe ordinary activities in everyday life. For example, we can consider a recipe as an algorithm for cooking a particular food.

Students could:

- brainstorm: What is an algorithm?
- identify what kind of algorithms they see when they shop
  - For example, recipes on the sides of products, instructions on in-store coffee
- describe an algorithm they follow when they shop. For example, do you have to follow certain steps at the self-service checkout or a scoop-and-weigh area?
- consider these questions:
  - Could the footstep stickers used on the floor in stores during COVID-19 be an algorithm?
  - 'When Mr Jones goes to the grocery store he follows the same path through the store every time.' Is this an algorithm? Why?
  - Why are algorithms useful when we shop?
- develop a flow chart with prompts to purchase bananas etc.
  - To support some learners this activity could be replaced by taking photographs of the steps involved in purchasing bananas and then used as a sequencing activity.

Suggested activities

- Explore how digital systems work by role-playing information processes; for example, a customer buys some groceries and pays for them at the counter; for example, role-play transfer of data to a stock list or a bank or from a scanner to a register.
- Draw a diagram or flow chart to show how a digital retail system functions (see image, page 6).
  - To make this task more accessible, use manipulatives such as arrows to show data pathways and blocks to show different aspects of a digital system.
- Discuss how digital systems meet the needs of those who use them.
- Collect data, pose and respond to questions, develop design ideas and manipulate materials and equipment to evaluate the development of students' knowledge of retail processes/systems.

Assessment suggestions

- Design their own supermarket and transform the classroom. Using boxes, packaging, devices and QR codes they could role-play using digital systems.
- Design an algorithm for a programmable device such as a Sphero. The device could be coded with specific instructions/tasks to navigate through a classroom version of supermarket aisles, collect items from a list and successfully complete shopping.
  - Changing situations/obstacles could be given to students to challenge them to redesign their algorithm. For example, moving around aisles avoiding fellow shoppers or spills. This is a good way to simulate a similar approach to debugging a computer program.
- Collect data on the space five products (multiple brands) take up on the store shelf.
- Generate a list of recommendations which could be sent to leading supermarket chains showing how digital systems could be used to support the independence of shoppers with disability.

Links to the Australian Curriculum

Table 1: Links to the Australian Curriculum: Digital Technologies Years 3–4 (depending on the task)

Digital Technologies ***Achievement standard***	By the end of Year 4, students describe how a range of digital systems (hardware and software) and their peripheral devices can be used for different purposes. They explain how the same data sets can be represented in different ways. Students define simple problems, design and implement digital solutions using algorithms that involve decision-making and user input. They explain how the solutions meet their purposes. They collect and manipulate different data when creating information and digital solutions. They safely use and manage information systems for identified needs using agreed protocols and describe how information systems are used.		
Strands	Digital Technologies knowledge and understanding • Representation of data Digital Technologies processes and production skills • Collecting, managing and analysing data • Creating designed solutions by: – investigating and defining – producing and implementing		
Content descriptions	• Recognise different types of data and explore how the same data can be represented in different ways (ACTDIK008) • Collect, access and present different types of data using simple software to create information and solve problems (ACTDIP009) • Define simple problems, and describe and follow a sequence of steps and decisions (algorithms) needed to solve them (ACTDIP010) • Implement simple digital solutions as visual programs with algorithms involving branching (decisions) and user input (ACTDIP011)		
Key concepts	• digital systems • data representation • data collection • algorithms • implementation	***Key ideas***	Thinking in Technologies • computational thinking • systems thinking
Cross-curriculum priorities		***General capabilities***	• Critical and creative thinking • Information and Communication Technology (ICT) Capability • Literacy • Numeracy

Useful links

- Australian Curriculum: Digital Technologies F–10 https://www.australiancurriculum.edu.au/f-10-curriculum/technologies/digital-technologies/
- Digital Technologies in focus project (DTiF) resources to assist in the implementation of the Australian Curriculum: Digital Technologies www.australiancurriculum.edu.au/resources/digital-technologies-in-focus/resources/
- Australian Computing Academy (ACA) – Unpack the curriculum, Years 3–4 (digital systems, algorithms, data representation, data collection, implementation) https://aca.edu.au/curriculum/

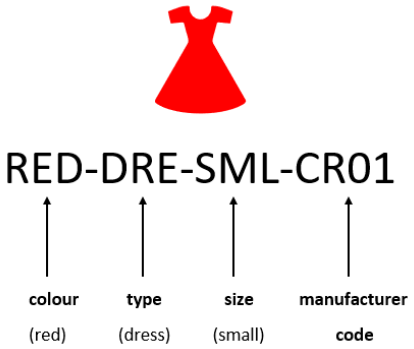
Table 2: Links to the Australian Curriculum: Digital Technologies Years 5–6

Digital Technologies ***Achievement standard***	By the end of Year 6, students explain the fundamentals of digital system components (hardware, software and networks) and how digital systems are connected to form networks. They explain how digital systems use whole numbers as a basis for representing a variety of data types. Students define problems in terms of data and functional requirements and design solutions by developing algorithms to address the problems. They incorporate decision-making, repetition and user interface design into their designs and implement their digital solutions, including a visual program. They explain how information systems and their solutions meet needs and consider sustainability. Students manage the creation and communication of ideas and information in collaborative digital projects using validated data and agreed protocols.		
Strands	Digital Technologies knowledge and understanding • Digital systems Digital Technologies processes and production skills • Evaluating		
Content descriptions	• Examine the main components of common digital systems and how they may connect together to form networks to transmit data (ACTDIK014) • Explain how student solutions and existing information systems are sustainable and meet current and future local community needs (ACTDIP021)		
Key concepts	• abstraction • digital systems • algorithms • interactions	***Key ideas***	Thinking in Technologies • computational thinking • systems thinking
Cross-curriculum priorities		***General capabilities***	• Critical and creative thinking Information and Communication Technology (ICT) Capability • Literacy • Numeracy

Useful links

- Australian Curriculum: Digital Technologies F–10 www.australiancurriculum.edu.au/f-10-curriculum/technologies/digital-technologies/
- Digital Technologies in focus project (DTiF) resources to assist in the implementation of the Australian Curriculum: Digital Technologies www.australiancurriculum.edu.au/resources/digital-technologies-in-focus/resources/
- Australian Computing Academy (ACA) – Unpack the curriculum, Years 5–6 (digital systems, algorithms, data representation, data collection, implementation) https://aca.edu.au/curriculum/

Sample picture glossary

Barcode A barcode is a method of representing data in a visual, machine-readable form. Barcodes usually consist of numbers and a pattern of parallel lines of different widths. Barcodes are typically used on product packaging.	 *Image source: https://pixabay.com/vectors/bar-code-information-data-business-24157/*
QR code A quick response or QR code is like a two-dimensional barcode that can be digitally scanned. QR codes can contain vast amounts of data, many times more than the type of barcode common on supermarket products. This makes QR codes perfect for encoding data from a wide variety of media. QR codes can appear on packaging and signs in a store.	 *Image source: https://pixabay.com/vectors/code-scan-qr-code-handy-phone-156629/*
SKU The stock keeping unit (SKU) is a unique code or number assigned to a product by a retail store to track stock (inventory). It sometimes looks like a barcode.	

Example of retail digital systems