Introduction to the Digital Technologies curriculum (F-6)

Darrel Branson
VCAA Digital Coding Specialist Teacher

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Overview of this Session

- Introduction to the Digital Technologies curriculum
  - What is Digital Technologies
  - Key concepts
  - Ways of thinking
- Accessing curriculum materials
- Unpacking the Strands
- VCAA Resources

Digital Technologies curriculum

What is Digital Technologies?

- Curriculum area within the Victorian Curriculum that provides students with the opportunity to develop **computational thinking, design thinking and systems thinking.**

- Students will become familiar with identifying the **digital systems** around them, how those systems interact and communicate in **networks**, and how **data is collected, stored and transmitted.**

- As their understanding develops, students will **design, create and evaluate** their own digital solutions through the use of **programming languages.**

What is Digital Technologies?

- Thinking underpins the Digital Technologies curriculum.

- There are elements of coding throughout the curriculum. But only 4 out of 42 Content Descriptions from F - 10 specifically address students coding.

- Many aspects can be explored with Unplugged activities (without the use of devices or computers).

Aims of the Digital Technologies curriculum

Aims of the curriculum

- design, create, manage and evaluate … digital solutions
- use computational thinking and key concepts of **abstraction; data collection, representation and interpretation, specification, algorithms and implementation**
- confidently use **digital information systems**
- apply **protocols** and **legal practices** that support **safe**, **ethical** and **respectful** communications and **collaboration** with audiences
- apply **systems thinking** to **monitor, analyse, predict and shape interactions** between information systems

Progression of programming languages F-10

Visual Programming (Levels 3-6)

- Block based, for example:
  - Scratch or other block based programming software

General Purpose (Levels 7-8)

- Text based language, for example:
  - Python
  - Java Script
  - Visual Basic

Object Oriented (Levels 9-10)

- With graphical user interfaces, for example:
  - Visual Basic
  - C++

An Important Distinction

The Digital Technologies curriculum area is not ICT.

Information and Communication Technologies (ICT) are powerful tools that can support student learning across curriculum.

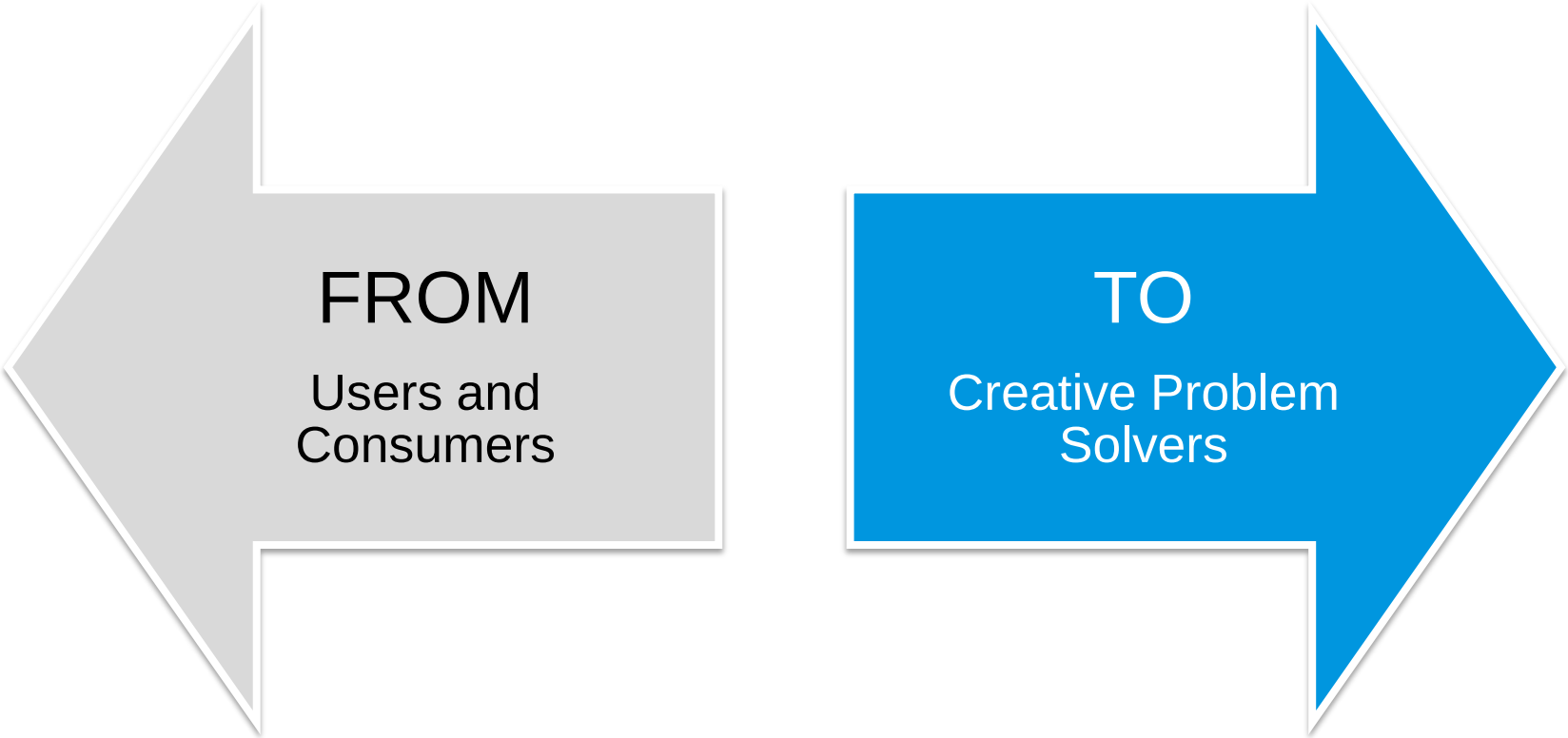
The Digital Technologies curriculum has its own specific body of knowledge, skills and understandings.

It is also important that students know how to use these ICT efficiently and responsibly, as well as learning how to protect themselves and secure their data.

Why Digital Technologies?

- Specific ways of thinking – much of curriculum area is underpinned by computational thinking
- Problem solving
- Students as developers of innovative and creative digital solutions

Why Digital Technologies?



Key concepts

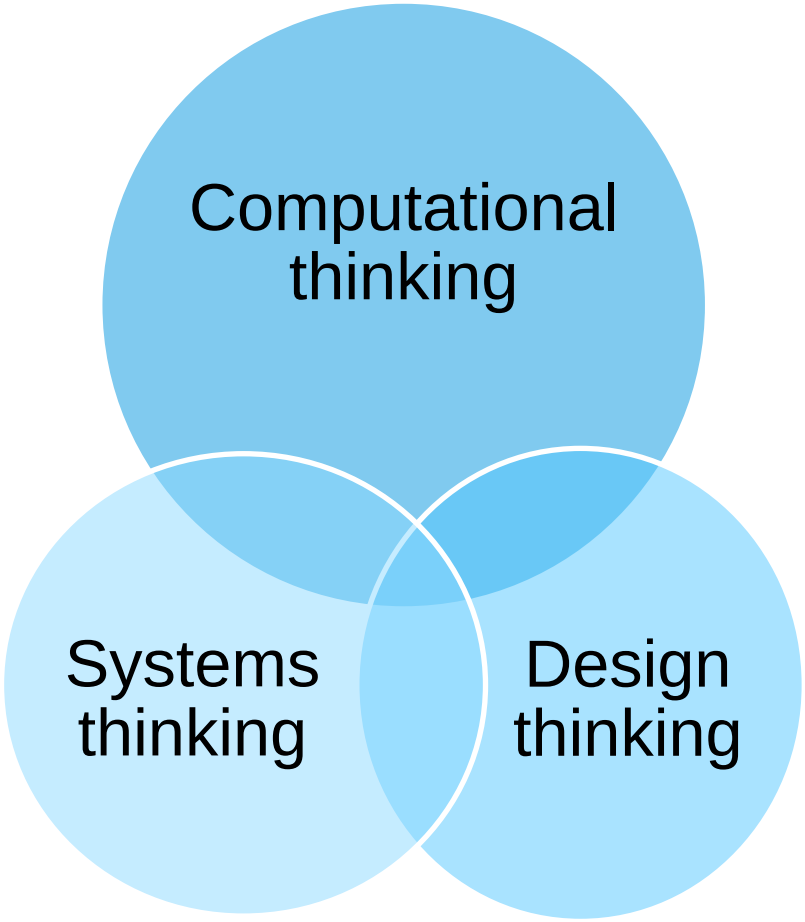
Key concepts

Concept	Definition
Abstraction	Hiding details not directly relevant, allows for solutions to be transferred across contexts.
Data collection	Creating information and utilising it in different ways to extract meaning
Specification, algorithms and development	Sequential and detailed instructions, leads to developing coded solutions
Digital systems	Connected hardware, software and networks, and methods of communication
Interactions and impacts	How people actually interact with technology and the effect on society and the environment

http://victoriancurriculum.vcaa.vic.edu.au/technologies/digital-technologies/introduction/learning-in-digital-technologies

Ways of thinking

Ways of thinking



Computational thinking

An approach that involves breaking down problems into the smallest discrete parts, identifying and organising the data needed to solve the problem, and creating step by step sequences of instructions for implementing a solution.

Decomposition - breaking down the problem

Data - user input, gathered by sensors, time, duration, conditions...

Algorithm - sequence of instructions

Design thinking

Using circumstances, events or identified problems to imagine creative and innovative solutions.

The process of generating ideas when developing a solution:

- What if we...
- Wouldn’t it be great if..
- How about...
- Why don’t we…

Visualise the solutions - draw, sketch, mock-up, prototype, justify, evaluate.

“Is there a better way?”

Systems thinking

- Exploring the connections and interactions between components, devices and people
- Interactions of components or resources within one digital system (could involve peripheral devices)
- Interactions of digital systems within networks or information systems (intended vs unintended outputs)
- Interactions of people with digital systems
- Impacts of digital systems on individuals, groups and society in general

Accessing the Digital Technologies curriculum

Victorian Curriculum
Foundation–10

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Rationale and Aims

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Rationale

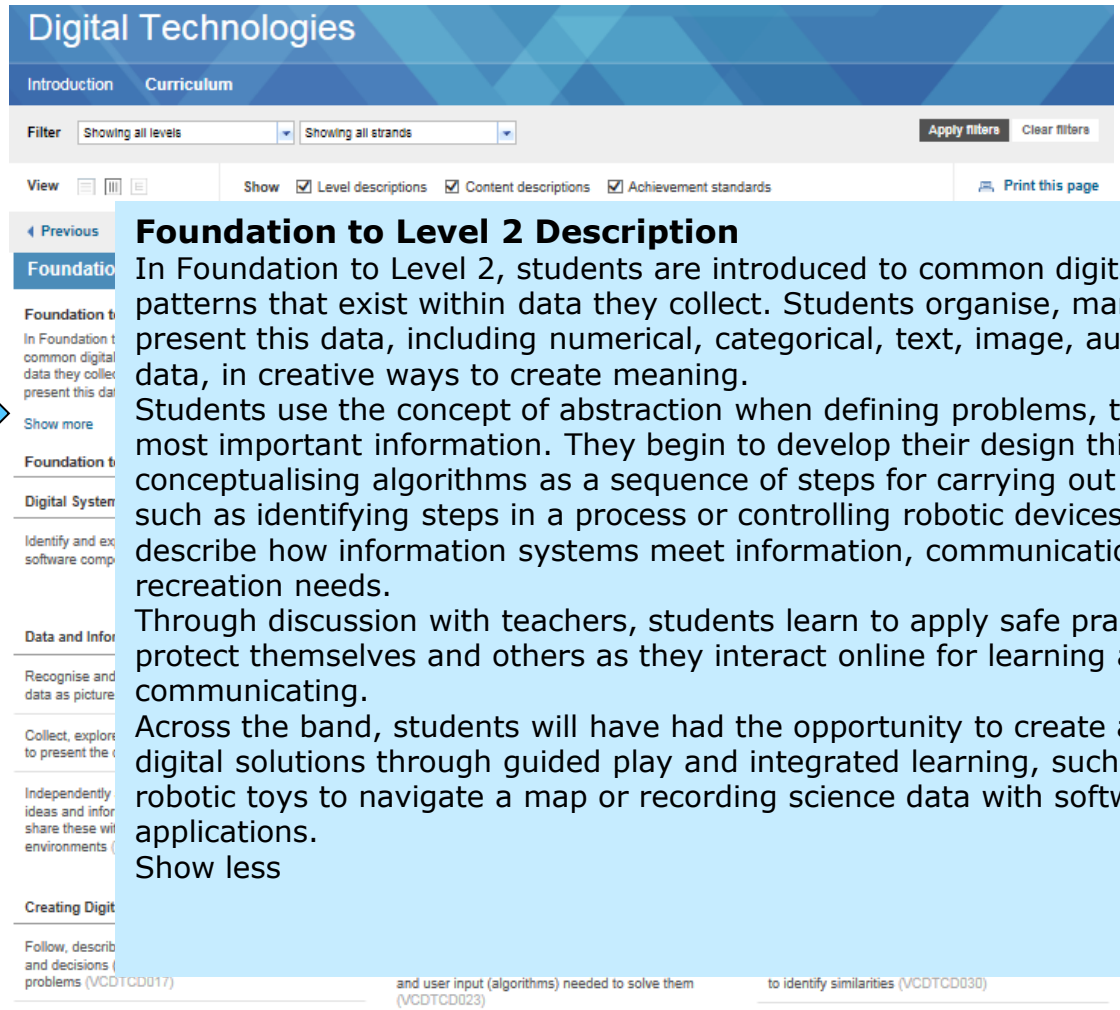
The Digital Technologies curriculum enables students to become confident and creative developers of digital solutions through the application of information systems and specific ways of thinking about problem solving.

Students acquire a deep knowledge and understanding of digital systems, data and information and the processes associated with creating digital solutions so they can take up an active role in meeting current and future needs.

The curriculum has been designed to provide practical opportunities for students to explore the capacity of information systems to systematically and innovatively transform data into digital solutions through the application of computational, design and systems thinking.

http://victoriancurriculum.vcaa.vic.edu.au/technologies/digital-technologies/introduction/rationale-and-aims

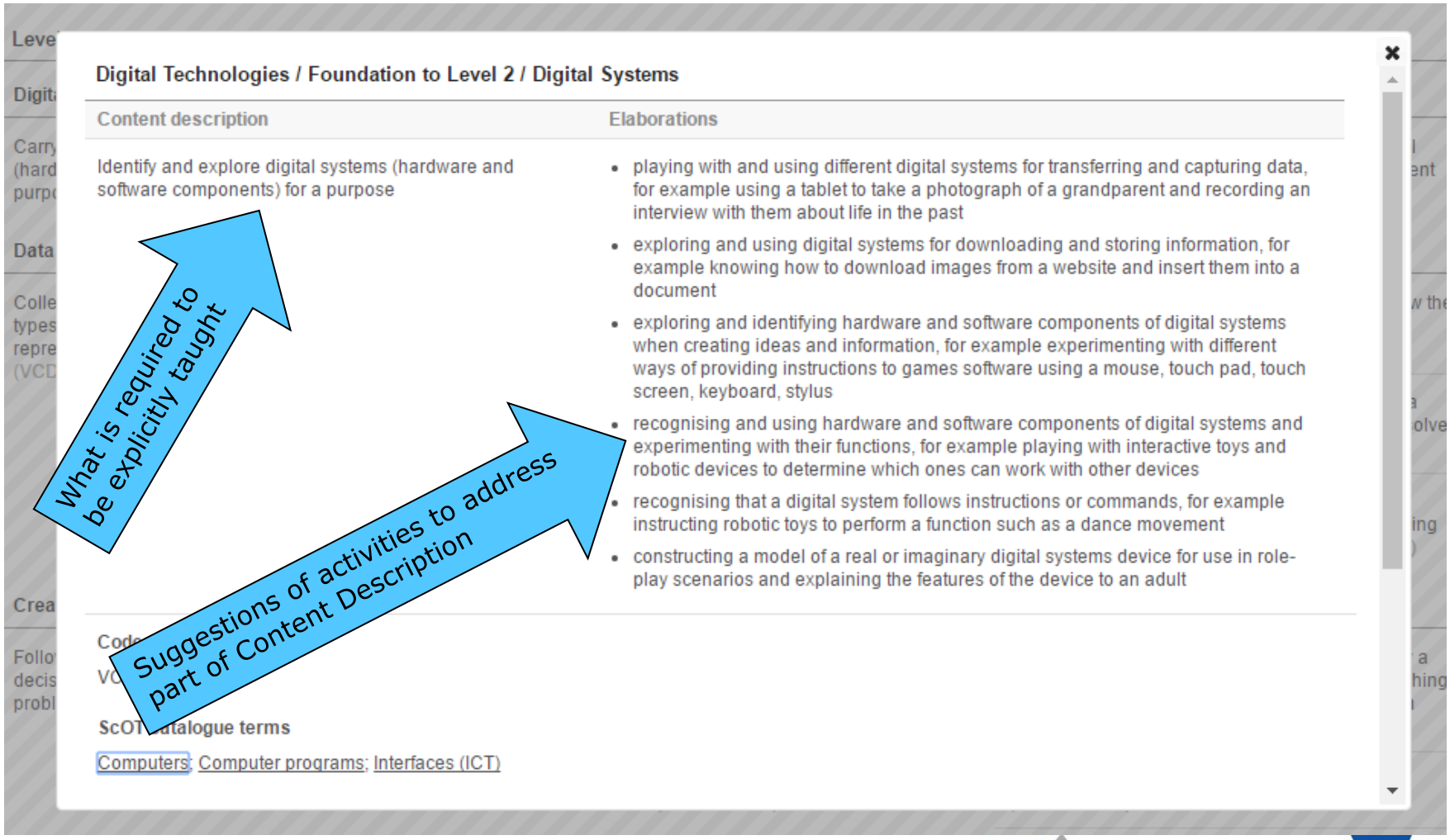
Curriculum



Show More

http://victoriancurriculum.vcaa.vic.edu.au/technologies/digital-technologies/curriculum/f-10#level=3-4

Elaborations



Scope and Sequence F-10

Levels

Strands

Content Descriptions

Achievement Standards

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Digital Technologies: Foundation – Level 10

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	Foundation – Level 2	Levels 3 and 4	Levels 5 and 6	Levels 7 and 8	Levels 9 and 10
Digital Systems					
	Identify and explore digital systems (hardware and software components) for a purpose	Explore a range of digital systems with peripheral devices for different purposes, and transmit different types of data	Examine the main components of common digital systems and how such digital systems may connect together to form networks to transmit data	Investigate how data are transmitted and secured in wired, wireless and mobile networks	Investigate the role of hardware and software in managing, controlling and securing the movement of and access to data in networked digital systems
Data and Information					
	Recognise and explore patterns in data and represent data as pictures, symbols and diagrams	Recognise different types of data and explore how the same data can be represented in different ways	Examine how whole numbers are used as the basis for representing all types of data in digital systems	Investigate how digital systems represent text, image and sound data in binary	Analyse simple compression of data and how content data are separated from presentation
	Collect, explore and sort data, and use digital systems to present the data creatively	Collect, access and present different types of data using simple software to create information and solve problems	Acquire, store and validate different types of data and use a range of software to interpret and visualise data to create information	Acquire data from a range of sources and evaluate their authenticity, accuracy and timeliness	Develop techniques for acquiring, storing and validating quantitative and qualitative data from a range of sources, considering privacy and security requirements
	Independently and with others create and organise ideas and information using information systems, and share these with known people in safe online environments	Individually and with others, plan, create and communicate ideas and information safely, applying agreed ethical and social protocols	Plan, create and communicate ideas, information and online collaborative projects, applying agreed ethical, social and technical protocols	Analyse and visualise data using a range of software to create information, and use structured data to model objects or events	Analyse and visualise data to create information and address complex problems, and model processes, entities and their relationships using structured data
				Manage, create and communicate interactive ideas, information and projects collaboratively online, taking safety and social contexts into account	Manage and collaboratively create interactive solutions for sharing ideas and information online, taking into account social contexts and legal responsibilities
Creating Digital Solutions					
	Follow, describe and represent a sequence of steps and decisions (algorithms) needed to solve simple problems	Define simple problems, and describe and follow a sequence of steps and decisions involving branching and user input (algorithms) needed to solve them	Define problems in terms of data and functional requirements, drawing on previously solved problems to identify similarities		Define and decompose real-world problems precisely, taking into account functional and non-functional requirements, interviewing stakeholders to
			Design a user interface for a digital system, generating and considering alternative design ideas		
			Design, modify and follow simple algorithms represented diagrammatically and in English, involving sequences of steps, branching, and iteration	Design algorithms represented diagrammatically and in English, and trace algorithms to predict output for a given input and to identify errors	Design algorithms represented diagrammatically and in structured English and validate algorithms through tracing and test cases
		Develop simple solutions as visual programs	Develop digital solutions as simple visual programs	Develop and modify programs with user interfaces involving branching, iteration and functions using a general-purpose programming language	Develop modular programs, applying selected algorithms and data structures including using an object-oriented programming language
	Explore how people safely use common information systems to meet information, communication and recreation needs	Explain how student-developed solutions and existing information systems meet common personal, school or community needs	Explain how student-developed solutions and existing information systems meet current and future community and sustainability needs	Evaluate how well student-developed solutions and existing information systems meet needs, are innovative and take account of future risks and sustainability	Evaluate critically how well student-developed solutions and existing information systems and policies take account of future risks and sustainability and provide opportunities for innovation
Achievement Standard					
	By the end of Level 2, students identify how common digital systems are used to meet specific purposes. Students use digital systems to represent simple patterns in data in different ways and collect familiar data and display them to convey meaning. Students design solutions to simple problems using a sequence of steps and decisions. They create and organise ideas and information using information systems and share these in safe online environments.	By the end of Level 4, students describe how a range of digital systems and their peripheral devices can be used for different purposes. Students explain how the same data sets can be represented in different ways. They collect and manipulate different data when creating information and digital solutions. They plan and safely use information systems when creating and communicating ideas and information, applying agreed protocols. Students define simple problems, and design solutions using algorithms involving decision-making and user input. They evaluate their solutions and explain their purpose.	By the end of Level 6, students explain the functions of digital system components and how digital systems are connected to form networks that transmit data. Students explain how digital systems use whole numbers as a basis for representing a variety of data types. They manage the creation and communication of ideas, information and digital projects collaboratively using validated data and agreed protocols. 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 develop their digital solutions, including a visual program. Students explain how information systems and their developed solutions meet current and future needs taking sustainability into account.	By the end of Level 8, students distinguish between different types of networks and their suitability in meeting defined purposes. Students explain how text, image and sound data can be represented and secured in digital systems and presented using digital systems. They analyse and evaluate data from a range of sources to model solutions and create information. They manage the collaborative creation of interactive ideas, information and projects and use appropriate codes of conduct when communicating online. Students define and decompose problems in terms of functional requirements and constraints. They design user experiences and algorithms incorporating branching and iterations, and develop, test, and modify digital solutions. Students evaluate information systems and their solutions in terms of meeting needs, innovation and sustainability.	By the end of Level 10, students explain the control and management of networked digital systems and the data security implications of the interaction between hardware, software and users. Students explain simple data compression, and why content data are separated from presentation. They take account of privacy and security requirements when selecting and validating data and use digital systems to analyse, visualise and model salient aspects of data. Students share and collaborate online, establishing protocols for the legal and safe use, transmission and maintenance of data and projects. Students define and decompose complex problems in terms of functional and non-functional requirements. They design and evaluate user experiences and algorithms, and develop and test modular programs, including an object-oriented program. Students evaluate their solutions and information systems in terms of risk, sustainability and potential for innovation.

http://victoriancurriculum.vcaa.vic.edu.au/technologies/digital-technologies/introduction/scope-and-sequence

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Strands

Strands F-10

Digital Systems	Data and Information	Creating Digital Solutions
Focuses on the hardware, software and network components of digital systems. Students initially learn about a range of hardware and software, and progress to an understanding of how data are transmitted between components within a system, and how the hardware and software interact to form networks.	**Focuses on the properties of data**, how they are collected and represented, and how they are interpreted in context to produce information. Students learn how data are represented and structured symbolically for use by digital systems, as well as techniques for collecting, managing and organising data that is used to solve problems and create and communicate ideas and information.	**Explores the** interrelated **processes** and associated **skills by which students create digital solutions**. Students engage in the four processes of analysing, designing, developing and evaluating. Creating Digital Solutions requires skills in using digital systems and computational, design and systems thinking, and interacting safely by using appropriate technical and social protocols.

Digital Systems

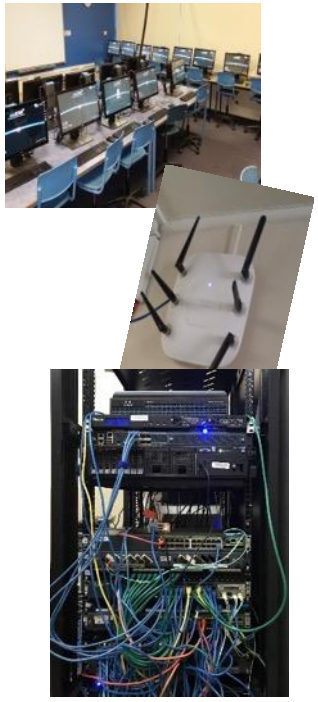
Data and Information

Creating Digital Solutions

Digital Systems Levels F-6

Levels F-2	Levels 3 and 4	Levels 5 and 6
Identify and **explore digital systems** (hardware and software components) **for a purpose.**	Explore a range of digital systems with **peripheral devices** for different purposes, and **transmit different types of data.**	Examine the **main components of common digital systems**, and how such **systems may connect together to form networks** to transmit data

Example: Digital Systems

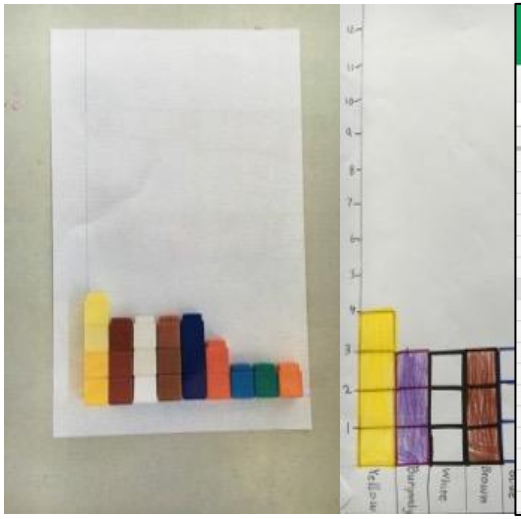


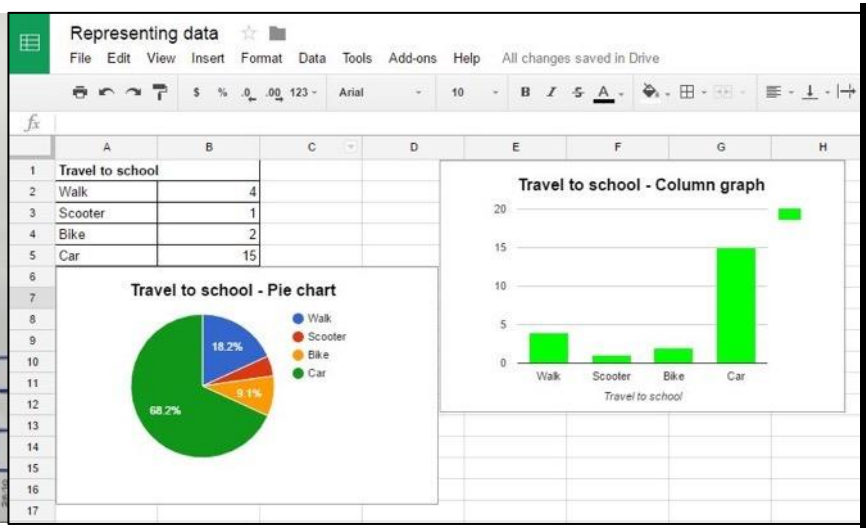
F - 2 → 3 - 4 → 5 - 6

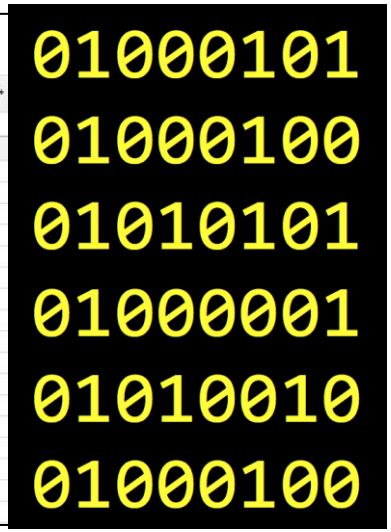
Data and Information Levels F-6

Levels F-2	Levels 3 and 4	Levels 5 and 6
Recognise and explore patterns in data and represent data as pictures, symbols and diagrams	Recognise different types of data and explore how the **same data can be represented in different ways**	Examine how **whole numbers are used** as the basis for representing all types of data in digital systems
Collect, explore and sort data, and use digital systems to present the data creatively	**Collect, access and present** different types of data using simple software to create information and solve problems	**Acquire, store and validate** different types of data and use a range of software to interpret and visualise data to create information
Independently and with others **create and organise ideas and information** using information systems, and share these with known people in safe online environments	Individually and with others, **plan, create and communicate ideas and information** safely, applying agreed ethical and social protocols)	**Plan, create and communicate ideas, information and online collaborative projects**, applying agreed ethical, social and technical protocols

Example: Representing Data







F - 2 → **3 - 4** → **5 - 6**

Creating Digital Solutions Levels F-6

Levels F-2	Levels 3 and 4	Levels 5 and 6
	Define simple problems	Define problems in terms of data and functional requirements, drawing on previously solved problems to identify similarities
		Design a user interface for a digital system, generating and considering alternative design ideas
Follow, describe and represent a sequence of steps and decisions (algorithms) needed to solve simple problems	Describe and follow a sequence of steps and decisions involving branching and user input (algorithms) needed to solve them	Design, modify and follow simple algorithms represented diagrammatically and in English, involving sequences of steps, branching, and iteration
	Develop simple solutions as visual programs	Develop digital solutions as simple visual programs
Explore how people safely use common information systems to meet information, communication and recreation needs	Explain how student-developed solutions and existing information systems meet common personal, school or community needs	Explain how student-developed solutions and existing information systems meet current and future community and sustainability needs

Creating Digital Solutions

Explores processes and skills by which students *create* **digital solutions**

Four stages:

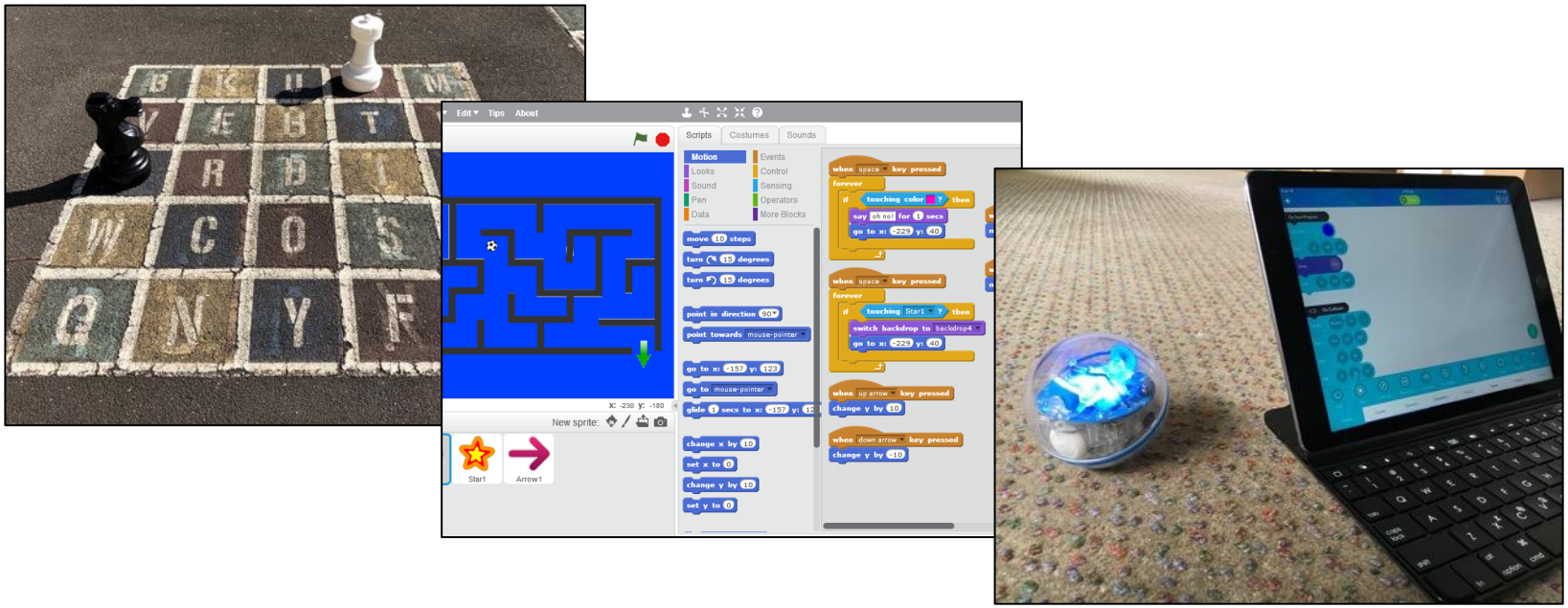
Analysing
Designing
Developing
Evaluating

Problem Solving Methodology

Creating Digital Solutions requires:

- skills in using digital systems
- different ways of thinking (computational, design and systems thinking)
- interacting safely by using appropriate
- technical and social protocols.

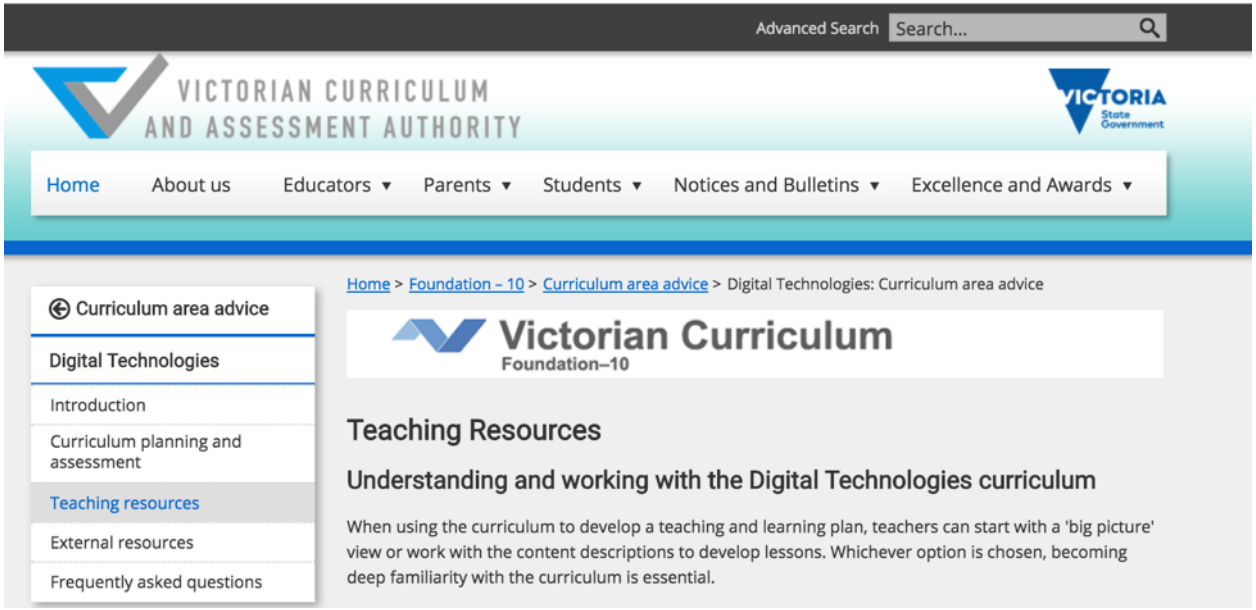
Example: Creating an algorithm



F - 2 → 3 - 4 → 5 - 6

VCAA Resources

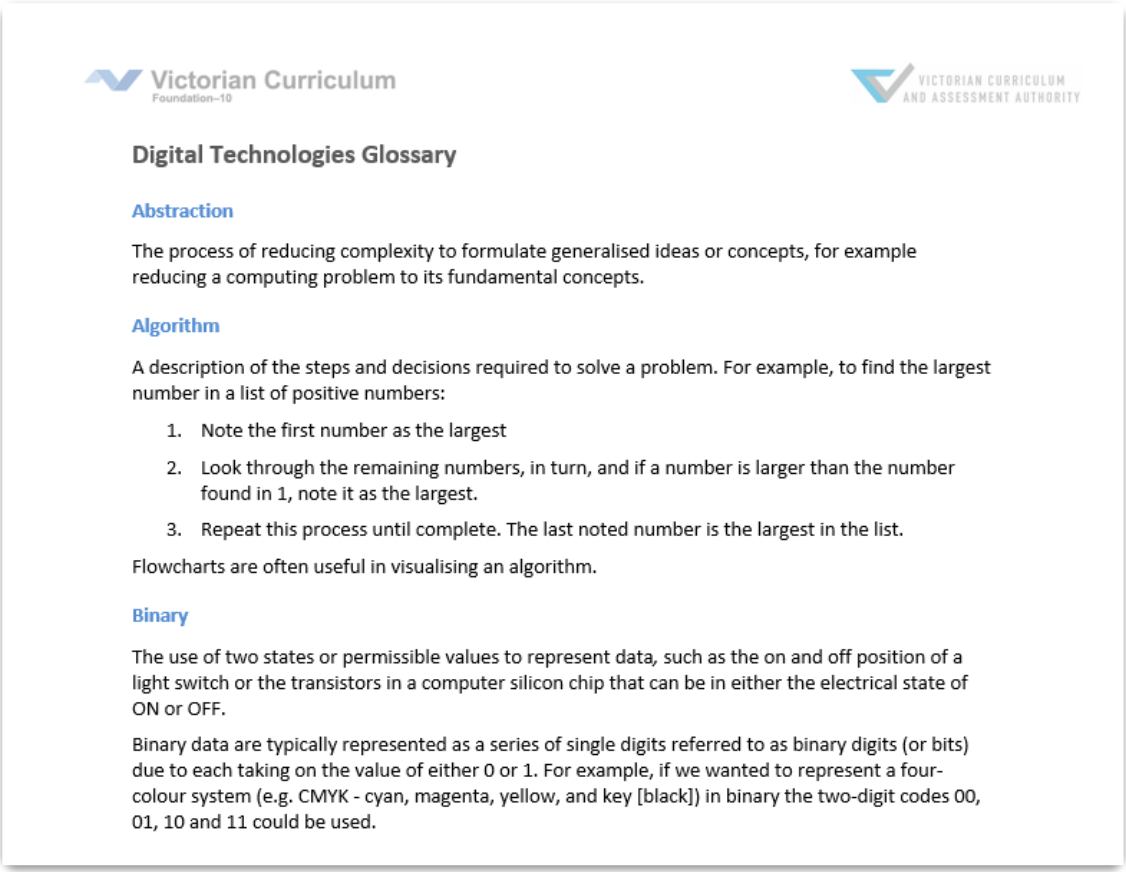
Further VCAA Resources



- Curriculum Area Plans
- Curriculum Planning Templates
- Unpacking Content Descriptions
- Indicative Progress

http://www.vcaa.vic.edu.au/Pages/foundation10/viccurriculum/digitech/teachresources.aspx

Glossary



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Digital Technologies Glossary

Abstraction

The process of reducing complexity to formulate generalised ideas or concepts, for example reducing a computing problem to its fundamental concepts.

Algorithm

A description of the steps and decisions required to solve a problem. For example, to find the largest number in a list of positive numbers:

1. Note the first number as the largest
2. Look through the remaining numbers, in turn, and if a number is larger than the number found in 1, note it as the largest.
3. Repeat this process until complete. The last noted number is the largest in the list.

Flowcharts are often useful in visualising an algorithm.

Binary

The use of two states or permissible values to represent data, such as the on and off position of a light switch or the transistors in a computer silicon chip that can be in either the electrical state of ON or OFF.

Binary data are typically represented as a series of single digits referred to as binary digits (or bits) due to each taking on the value of either 0 or 1. For example, if we wanted to represent a four-colour system (e.g. CMYK - cyan, magenta, yellow, and key [black]) in binary the two-digit codes 00, 01, 10 and 11 could be used.

http://victoriancurriculum.vcaa.vic.edu.au/technologies/digital-technologies/introduction/rationale-and-aims