

DTiF

Digital Technologies in focus

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CLASSROOM IDEAS: F–6

QR codes, digital systems and data representation



Figure 1: A QR code that will open the Australian Curriculum website on the Digital Technologies page



Figure 2: A smartphone scanning a QR code
Source: www.pixabay.com



Figure 3: A QR code clue used in a student scavenger hunt during an excursion to a local museum. Source: www.flickr.com/photos/royblumenthal/6102748078 Roy Blumenthal CC-BY-2.0

Creating and using QR codes in your classroom is one way to talk about data representation and digital systems: how they work, who uses them and for what purposes.

A quick response or QR code (Figure 1) 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.

When a QR code is scanned using a QR code scanning app (Figure 2), the small black and white squares are read by the smart device's image sensor, then interpreted by the system processor. The three large squares are used by the scanner to help with aligning the scan.

When scanned, encoded data* can be interpreted as numeric, alphanumeric, binary or Kanji (a system of Japanese writing) and, in some cases, in other forms.

QR codes are easy to make and they can even be customised in various ways with colours and images.

They can be used for a range of engaging purposes (Figure 3) in the classroom providing quick access to scaffolding materials or other resources.

QR codes are also very useful in an F–2 classroom where students may not yet have literacy skills needed to read a URL.

* See 'encryption of data' in the [Australian Curriculum: Technologies glossary download document](#)



Figure 4: QR code tree in a school library. Source: www.flickr.com/photos/info_grrl/9765971202/in/album-72157627495969639/ @GwynethJones-The Daring Librarian! CC BY-NC-SA 2.0

QR codes can be embedded on activity cards, worksheets or bookmarks for scanning with a mobile device to direct students to a specific website.

Students could:

- make QR codes to incorporate them into their poster or multimedia presentations
- use them to replay tutorials or instructions previously given by the teacher
- incorporate them in the classroom as part of activities (Figure 3)
- scan QR codes for supplementary resources during rotational activities (Figure 4)
- scan QR codes on an interactive word wall (using QR Codes or HP reveal or similar)
- incorporate QR into poster or presentations
- demonstrate something they have learned to a peer or teacher with video recordings of them doing/making something.

Inquiry questions

Exploring and describing how QR codes function, who uses them and how they might be incorporated into a digital solution, particularly in F–6, is a meaningful way for students to become more familiar with digital technologies.

Students could investigate:

- Who created QR codes and what was their original intended purpose?
- How do QR codes work? How could the process be explained using an algorithm?
- How are QR codes used in various industries, for example:
 - education (Figure 5)
 - manufacturing
 - food and fibre production and retail.
- Explain how QR as existing information systems could be sustainable.
- How could QR codes be used together with other ICT and digital technologies to create innovative digital solutions?
- In what ways could you use QR codes in the creation of digital solutions such as:
 - a choose your own adventure story that demonstrates branching and iteration
 - a virtual reality (VR) or augmented reality (AR) experience
 - methods for sharing and collaborating with others
 - data collection solutions
 - multimodal texts that include audio or video

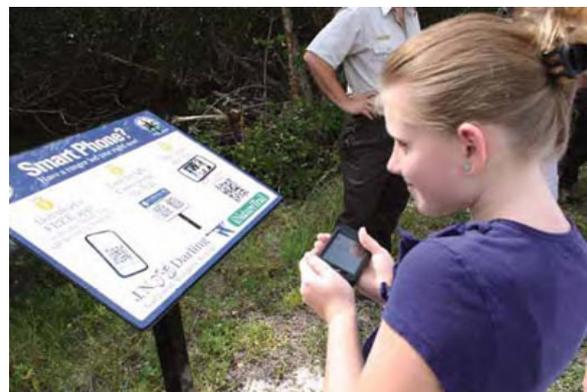


Figure 5: A QR code user at Ding Darling refuge. Source: www.publicdomainfiles.com/show_file.php?id=13961870415941

QR code tutorial

The steps involved to create and read a QR code can be used as an opportunity to talk about algorithms with Years 1–4 (V9) F–4 (V8.4).

Four easy steps to making a QR code

1. Visit a QR code generator website (Figure 6), for example www.qr-code-generator.com/
2. Choose what type of file or data that will be encoded to the QR code.
3. Choose a colour or make any adjustments to the look of the QR code (optional).
4. Download or save your QR code.

Tip: be sure to name your QR code image file so you know what data it contains for later. When you have a few QR codes saved it can be difficult to tell which one is which.

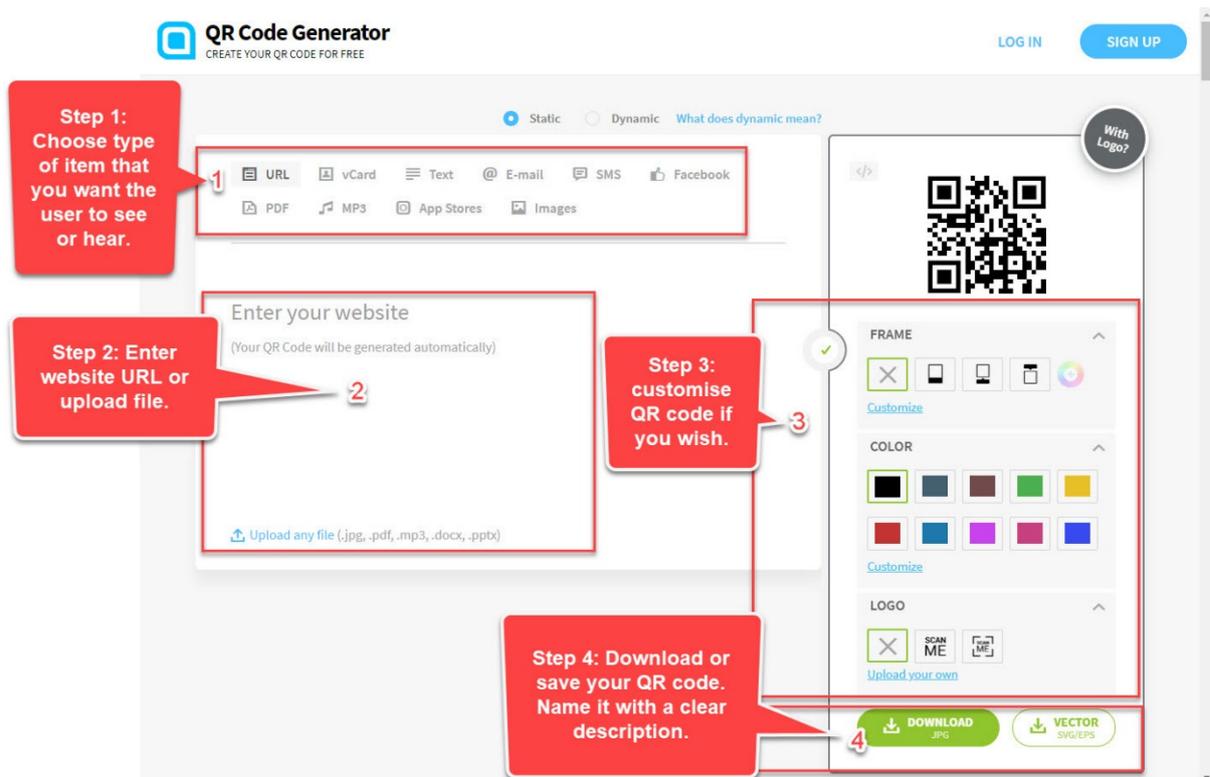


Figure 6: A QR code generator website

Using/scanning a QR code

To scan and decode a QR code you will need a smart device such as a mobile phone or tablet. Most of these devices will read a QR code by simply using the camera as a reader. The alternative method is to use a QR code reader app or software. QR code readers are available for desktop computers with webcams but are easier to use on a mobile device like a smart phone or tablet such as an iPad.

1. Try reading a QR code with the camera on your smart device or install either:
 - a. QR reader software if you are using a desktop or laptop computer
 - b. a QR code reader app if you are using a mobile device.
2. Open the software/app and position the QR code in front of the webcam or device camera.
3. The encoded data on the QR reader should now display directly on screen or via a link provided on screen by the QR reader.

Links to the Australian Curriculum

A variety of opportunities exist in F–6 including exploring how digital systems work using QR codes and how to create a digital solution. In Years 5–6 students could also use QR codes to explore the creation of digital solutions for a purpose and to meet specific user needs (creating user stories and design criteria – V9).

Table 1: Links to the Australian Curriculum: Digital Technologies Years 5–6 (V9)

Digital Technologies Achievement standard	<p>By the end of Year 6 students develop and modify digital solutions, and define problems and evaluate solutions using user stories and design criteria. They process data and show how digital systems represent data. Students design algorithms involving complex branching and iteration and implement them as visual programs including variables. They securely access and use multiple digital systems and describe their components and how they interact to process and transmit data. Students select and use appropriate digital tools effectively to plan, create, locate and share content, and to collaborate, applying agreed conventions and behaviours. They identify their digital footprint and recognise its permanence.</p>		
Strand Sub-strand	<p>Digital Technologies knowledge and understanding</p> <ul style="list-style-type: none"> • Digital systems • Data representation <p>Digital Technologies processes and production skills</p> <ul style="list-style-type: none"> • Evaluating • Collaborating and managing 		
Content descriptions	<ul style="list-style-type: none"> • investigate the main internal components of common digital systems and their function AC9TDI6K01 • explain how digital systems represent all data using numbers AC9TDI6K03 • evaluate existing and student solutions against the design criteria and user stories and their broader community impact AC9TDI6P06 • select and use appropriate digital tools effectively to create, locate and communicate content, applying common conventions AC9TDI6P07 		
Technologies Core concepts	<ul style="list-style-type: none"> • Systems • Systems thinking • Data • Interactions and impact 	Digital Technologies Core concepts	<ul style="list-style-type: none"> • Digital systems • Data representation • Abstraction
		General capabilities	<ul style="list-style-type: none"> • Literacy • Numeracy
Cross-curriculum priorities		Learning area or subject connections	<ul style="list-style-type: none"> • Mathematics

Table 2: Links to the Australian Curriculum: Digital Technologies Years 5–6 (V8.4)

Digital Technologies Achievement standard	<p>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.</p> <p>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.</p>
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	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 <ul style="list-style-type: none"> • Digital systems Digital Technologies processes and production skills <ul style="list-style-type: none"> • Evaluating 		
Content descriptions	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • abstraction • digital systems • data representation 	Key ideas	Thinking in Technologies <ul style="list-style-type: none"> • computational thinking • systems thinking
Cross-curriculum priorities		General capabilities	<ul style="list-style-type: none"> • Information and Communication Technology (ICT) Capability • Literacy • Numeracy

Useful links

- Kathy Schrock's guide to everything – QR codes in the classroom www.schrockguide.net/qr-codes-in-the-classroom.html
- * See 'encryption of data' in the Australian Curriculum: Technologies glossary [Australian Curriculum: Technologies glossary download document](#)

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