Digital Technologies – 9 and 10_ Data

	STRAND	Knowledge and understanding				Processes and production skills															
		Digital Systems		Representation of data		Collecting, managing and analysing data				*Creating Digital Solutions by:*											
										Investigating and defining		Generating and designing				Producing and implementing		Evaluating		Collaborating and managing			
	Content Description	Investigate the role of hardware and software in managing, controlling and securing the movement of and access to data in networked digital systems (ACTDIK034)		Analyse simple compression of data and how content data are separated from presentation (ACTDIK035)		Develop techniques for acquiring, storing and validating quantitative and qualitative data from a range of sources, considering privacy and security requirements (ACTDIP036)		Analyse and visualise data to create information and address complex problems, and model processes, entities and their relationships using structured data (ACTDIP037)		Define and decompose real-world problems precisely, taking into account functional and non-functional requirements and including interviewing stakeholders to identify needs (ACTDIP038)		Design the user experience of a digital system by evaluating alternative designs against criteria including functionality, accessibility, usability, and aesthetics (ACTDIP039)		Design algorithms represented diagrammatically and in structured English and validate algorithms and programs through tracing and test cases (ACTDIP040)		Implement modular programs, applying selected algorithms and data structures including using an object-oriented programming language (ACTDIP041)		Evaluate critically how student solutions and existing information systems and policies, take account of future risks and sustainability and provide opportunities for innovation and enterprise (ACTDIP042)		Create interactive solutions for sharing ideas and information online, taking into account social contexts and legal responsibilities (ACTDIP043)		Plan and manage projects using an iterative and collaborative approach, identifying risks and considering safety and sustainability (ACTDIP044)	
Sequence of Lessons / Unit	**Approx. time rq'd**	**Year**	CD	Achievement standard #	CD	Achievement standard #	CD	Achievement standard #	CD	Achievement standard #	CD	Achievement standard #	CD	Achievement standard #	CD	Achievement standard #	CD	Achievement standard #	CD	Achievement standard #	CD	Achievement standard #	CD	Achievement standard #
Data-driven innovation	10	9	☐		☐		☑	4	☑	4	☐		☐		☐		☐		☐		☑	9	☐		☐	

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Years 7 and 8 Achievement Standard	**Years 9 and 10 Achievement Standard**	
By the end of Year 8 • Students distinguish between different types of networks and defined purposes. (1) • They explain how text, image and audio data can be represented, secured and presented in digital systems. (2) • Students plan and manage digital projects to create interactive information. (3) • They define and decompose problems in terms of functional requirements and constraints. (4) • Students design user experiences and algorithms incorporating branching and iterations, and test, modify and implement digital solutions. (5) • They evaluate information systems and their solutions in terms of meeting needs, innovation and sustainability. (6) • They analyse and evaluate data from a range of sources to model and create solutions. (7) They use appropriate protocols when communicating and collaborating online. (8)	By the end of Year 10 • Students explain the control and management of networked digital systems and the security implications of the interaction between hardware, software and users. (1) • They explain simple data compression, and why content data are separated from presentation. (2) • Students plan and manage digital projects using an iterative approach. (3) • They define and decompose complex problems in terms of functional and non-functional requirements. (4) • Students design and evaluate user experiences and algorithms. (5) • They design and implement modular programs, including an object-oriented program, using algorithms and data structures involving modular functions that reflect the relationships of real-world data and data entities. (6) • They take account of privacy and security requirements when selecting and validating data. (7) • Students test and predict results and implement digital solutions. (8) • They evaluate information systems and their solutions in terms of risk, sustainability and potential for innovation and enterprise. (9) • They share and collaborate online, establishing protocols for the use, transmission and maintenance of data and projects. (10)	

Topic: Data
Units

Year 9	**Year 10**
Data-driven innovation 10 hours Examine the way 'big data' is being used on a large scale to inform decision-making.	**Organise, visualise and analyse 10 hours** Use tools to organise data and make sense of complex data to identify patterns and trends.

Data-driven innovation

Data from individuals and connected technologies is used to inform society, businesses, industry and governments. Smartphones can be used to collect data and contributes to a person's digital footprint. While this data may benefit the broader community it also raises privacy concerns about personal information. Problems and challenges faced by society can provide a useful context for examining existing data-driven digital solutions. Autonomous cars provide a useful context to examine the data required to enable this technology to work safely and become a reality on our roads.

Flow of activities				
Short text	My smartphone data Share ideas about what smartphone data may reveal about everyday actions and behaviours.	Consumer data Explore and present examples of ways personal data is used to inform companies.	Critically evaluate Explore case studies of businesses that have designed a digital solution to solve a problem.	Autonomous solutions Examine data and technology involved in autonomous devices and machines.
Questions to guide exploration	*How does smartphone use contribute to a person's digital footprint?*	*What insights can we gain from data related to consumer behaviour?*	*How does data enable innovation?*	*What data and technology are involved in autonomous devices and machines?*
Australian Curriculum alignment	*Collecting, managing and analysing data (ACTDIP036) (ACTDIP037)*	*Collecting, managing and analysing data (ACTDIP036) (ACTDIP037)* *Evaluating (ACTDIP042)*	*Evaluating (ACTDIP042)*	*Investigating and defining (ACTDIP038)* *Evaluating (ACTDIP042)*
What's this about?	Data from individuals and connected technologies is used to inform society, businesses, industry and governments. Data acquired from mobile phone usage can reveal much about a person such as their location, who they communicate with and how, and personal shopping habits including what they search for and buy online. Smartphone usage contributes to a person's digital footprint and raises privacy issues.	Consumer data collected from mobile phone tracking is used to improve customer experience. Companies can use technology to track consumer behaviour. A consumer's actions reveal what they desire, how they shop and why they buy. While this data may benefit consumers it also raises privacy concerns about personal information.	Problems and challenges faced by individuals, communities, industries, local businesses and governments can provide a useful context to examine existing digital solutions. Defining a problem ('problem identification') is often the first step in the process of coming up with possible solutions.	Use the example of autonomous cars to examine the data required to enable this technology to work safely and become a reality on our roads. Autonomous 3D mapping drones are being used to gather precision monitoring data to improve efficiencies in agricultural technology, a key growth area for Australian businesses.
The focus of the learning (in simple terms)	Organise students in collaborative groups to share ideas about the ways they use a smartphone and what the data about their actions and behaviours may reveal to companies. Share ideas using a collaborative tool such as Padlet, OneNote or Evernote. Students can collaboratively devise an online survey and/or use face-to-face surveys to collect data about smartphone use. The focus of the survey could be to ascertain extent of use, assess users' understanding of potential privacy issues or assess techniques people use to protect their data. Ensure the privacy of people being surveyed. Consider how the survey data will be stored, organised, validated, analysed and presented. The presentation could focus on the opportunities and risks of smartphone use. Refer to the term 'big data' and what students know and understand about it. Find out more through viewing a video or other resources.	Students explore and present examples of how personal data is used to inform companies. What types of data are used? How are data visualisations used and analysed? Students debate the use of data that is collected from their smartphone and used by companies. They create a presentation of what shopping in 2020 might be like. What data has driven these innovative practices? Connect the use of data to programming a digital solution (eg how to keep retail stock levels maintained, or how to attract a customer to a shop based on their personal data).	Consider case studies of businesses that have identified a problem, then designed and created a digital solution. These case studies are useful resources when critically evaluating an existing solution and considering its sustainability. Students may use an existing solution as a springboard when designing a solution of their own that aligns with their preferred future. Consider innovations in smart farming. How has data driven solutions and how has technology enabled innovation? (There may be more relevant investigations into innovation, depending on where your school is located.) Students could explore climate change. They could use data logging equipment and relevant sensors to gather their own data. The PocketLab Air enables students to do their own research on climate change and air pollution with a state-of-the-art sensor that measures CO_2, ozone and particulates. Another suitable context might be medical and health related sectors. Students could come up with an innovative digital solution to a problem and create a video in the format used by kickstarters to gain funding.	Produce a flow chart that shows the use of data in a relevant example that involves automation. Connect the data focus of this inquiry with programming of robotic devices and drones that sense their environment.

Supporting resources and tools and purpose/context for use	7 in 10 smartphone apps share your data with third-party services Use this article to provide insights into how your smartphone use can reveal your personal information and behaviours. Big data This video explores what big data is and how it works. What is big data? This video describes big data in simple terms. Reinventing society in the wake of big data This article includes a well presented video about big data, what it means to us and how we are connected to big data. Beat the news animation Learn more about big data through this video animation. Apostle animation Explore big data challenges that face Australia's national security agencies.	How stores track your shopping behaviour This video provides a range of ways retailers can learn about shopper behaviour through data collection and analysis. Retail innovation This video explains how retailers can interact with customers via technology on a personal level to tailor the customer experience. Retail stores are tracking your cell phones?! This video raises consumer concerns about their data being used by shops.	Video about Farmware, a farm management app This video case study describes an innovative app solution that assists with farm resourcing. Video about smart frost management This video case study describes an innovative solution to frost management using sensor technology. MyAsthma app This app help patients understand their asthma by providing environmental and lifestyle information that may be relevant to their condition, together with data indicating the status of their asthma. Smart farming This video is about using sensors and software to monitor crops. Sample project This animated video explores smart agriculture. What happens when farming goes high-tech? This National Geographic video examines high-tech farming, including the use of soil maps and drones. Precision farming and the role of big data This video explores how big data can help farmers produce higher yields using fewer chemicals. The role of big data in medicine This article explores how technology is revolutionising our understanding and treatment of disease. Agworld for iPad This free app is a collaborative farming solution that enables farmers and agronomists to work together. The app provides document management, data capture tools, farm maps, and more. PocketLab Air Do your own research on climate change and air pollution with a state-of-the-art sensor that measures CO_2, ozone and particulates.	Why Google's new self-driving cars could be the safest on the road This video is about the safety features in Google's driverless cars. Realising the benefits of autonomous vehicles in Australia This report examines the future of autonomous cars in Australia, and provides recommendations. How data science is driving the driverless car This article explores data in relation to driverless cars.
Assessment	**Suggested approaches:** Presentation or demonstration **Achievement standard** **Define** and **decompose** complex problems in terms of functional and non-functional requirements. **Evaluate** information risk, sustainability and potential for innovation and enterprise.	**Suggested approaches:** Presentation or demonstration **Achievement standard** **Define** and **decompose** complex problems in terms of functional and non-functional requirements. **Evaluate** information risk, sustainability and potential for innovation and enterprise.	**Suggested approaches:** • Design plan • Video presentation **Achievement standard** **Define** and **decompose** complex problems in terms of functional and non-functional requirements. **Evaluate** information risk, sustainability and potential for innovation and enterprise.	**Suggested approaches:** Presentation or demonstration **Achievement standard** **Define** and **decompose** complex problems in terms of functional and non-functional requirements. **Evaluate** information risk, sustainability and potential for innovation and enterprise.