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**Artificial intelligence (AI): years 5 and 6**

The following table identifies how the key aspects of understanding how AI works, types of AI, and responsible use and application of AI are evident in content descriptions from across the Australian Curriculum Version 9.0. From this information, teachers can develop a sequential program for learning about AI by connecting the key aspects of learning with learning area and subject-specific content descriptions.

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| Years 5 and 6 |
| Key aspect 1: Understanding how AI works |
| Learning area/subject | Strand/sub-strand | Content descriptions | Content elaborations |
| **Digital Technologies**  | **Knowledge and understanding**Digital systems | examine how digital systems form networks to transmit dataAC9TDI6K02 | * explaining how separate systems can be connected in different ways to exchange data, for example how a laptop can be connected to a network via a cable or radio waves
* describing the way data is structured and transmitted through a network, for example broken up into packets (small pieces) and passed from the source, through multiple devices, to the destination
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| **Knowledge and understanding**Data representation | explain how digital systems represent all data using numbersAC9TDI6K03 | * representing data using whole numbers and recognising this is how digital systems represent data, for example converting letters in a message to numbers using their position in the alphabet
* explaining how the data type used to represent data changes the operations that can be performed on it, for example adding numbers performs addition whereas adding strings joins them
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| explore how data can be represented by off and on states (zeros and ones in binary)AC9TDI6K04 | * making collaboratively a long thread with beads representing binary for the letters that spell the Country/Place name in the local First Nations language and English, and could be displayed as a ‘binary banner’ as an Acknowledgement of Country that we are on the Traditional Lands of the <insert name> Peoples
* demonstrating that an on/off state in a circuit can represent the digits one and zero, and this is how digital systems represent data
* recognising how the answer to a yes/no question can be represented using on/off states, for example switching a light on or off in a circuit or a long or short dash (beep) in Morse code
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| **Processes and production skills**Generating and designing | design algorithms involving multiple alternatives (branching) and iterationAC9TDI6P02 | * designing an algorithm or understanding and modifying an existing algorithm to fix an error or change functionality, for example exploring issues in drought-prone areas to decide when to water a garden, taking into account humidity as well as soil moisture level
* creating the steps, decisions and loops in algorithms and knowing what step they are up to, for example repeating the steps to add 2 digits for each column in multi-digit addition, knowing which column they are adding and when to stop
* constructing more than one sequence of steps that solve the same problem and explaining why one is better than the other, for example specifying the exact route through a maze versus using the right-hand rule that works for all mazes
* modelling a decision that has more than 2 options to select the next step, for example selecting transport IF distance is less than 2 km THEN walk, ELSE IF the distance is less than 5 km THEN ride a bike, ELSE catch the bus
* planning algorithms that repeat until a condition is met, for example keep mixing UNTIL the ingredients are combined or subtracting a number UNTIL the result reaches zero
* designing an algorithm including branching and iteration which responds to data, for example how First Nations Australian rangers use structured procedures to respond to live tracking data that indicates feral buffalo are approaching an environmentally or culturally significant site
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| **Processes and production skills**Producing and implementing | implement algorithms as visual programs involving control structures, variables and inputAC9TDI6P05 | * writing and editing programs to solve problems using branching, iteration and variables in a visual programming environment, for example writing a program to draw a rotated shape a given number of times using Turtle Graphics
* writing programs that take input from the user or environment and storing that input in a variable for later use, for example asking the user how many shapes to draw in a circle and using that to calculate the number of iterations and angle to rotate each time
* writing programs that make decisions involving multiple alternatives, for example an interactive quiz that checks if the answer is correct, gives feedback and updates the score, or gives a final grade based on the score
* writing programs that repeat multiple steps based on the user's input, for example repeatedly drawing a shape a given number of times, shifting the position between each iteration
* stating the expected behaviour of a program, running the program to check it is correct and fixing any errors, for example 'when I press the left arrow key, the cat should move left, finding the cat moves right, and fixing it by changing the 10 to -10 to alter the direction'
* programming digital systems to perform automated tasks, such as closing gates, for example simulating the work of First Nations Australian rangers attempting to lure and capture feral animals
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| **Mathematics – Year 5** | **Number** | create and use algorithms involving a sequence of steps and decisions and digital tools to experiment with factors, multiples and divisibility; identify, interpret and describe emerging patternsAC9M5N010 | * creating algorithms that use multiplication and division facts to determine if a number is a multiple or factor of another number; for example, using a flow chart that determines whether numbers are factors or multiples of other numbers using branching, such as yes/no decisions
* identifying lowest common multiples and highest common factors of pairs or triples of natural numbers; for example, the lowest common multiple of {6,9} is 18, and the highest common factor is 3; the lowest common multiple of {3,4,5} is 60 and the highest common factor is one
* using the “fill down” function of a spreadsheet and a multiplication formula to generate a sequence of numbers that represent the multiples of any number you enter into the cell; describing and explaining the emerging patterns
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| **Space** | construct a grid coordinate system that uses coordinates to locate positions within a space; use coordinates and directional language to describe position and movementAC9M5SP02 | * investigating how autonomous vehicles use mapping, GPS systems, communication systems and path planning to navigate within a space
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| **Statistics** | acquire, validate and represent data for nominal and ordinal categorical and discrete numerical variables, to address a question of interest or purpose using software including spreadsheets; discuss and report on data distributions in terms of highest frequency (mode) and shape, in the context of the dataAC9M5ST01 | * exploring how travel and online shopping websites and apps collect ordinal data from users to provide customer satisfaction and popularity ratings, and how they use recommendation algorithms to assist customers in travel planning or retail purchasing
 |
| interpret line graphs representing change over time; discuss the relationships that are represented and conclusions that can be madeAC9M5ST02 | * exploring how line graphs can be used by humans and AI systems to make predictions by providing historical data and showing trends
 |
| **Probability** | list the possible outcomes of chance experiments involving equally likely outcomes and compare to those which are not equally likelyAC9M5P01 | * investigating how bias and fairness can relate to outcomes being equally and not equally likely, and discussing how this might inform strategies for mitigating bias in AI systems
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|  | **Probability** | conduct repeated chance experiments including those with and without equally likely outcomes, observe and record the results; use frequency to compare outcomes and estimate their likelihoodsAC9M5P02 | * conducting experiments, recording the outcomes and the number of times the outcomes occur, describing the relative frequency of each outcome; for example, using “I threw the coin 10 times, and the results were 3 times for a head, so that is 3 out of 10, and 7 times for a tail, so that is 7 out of 10”
* experimenting with and comparing the outcomes of spinners with equal-coloured regions compared to unequal regions; responding to questions such as “How does this spinner differ to one where each of the colours has an equal chance of occurring?”, giving reasons
* comparing the results of experiments using a fair dice and one that has numbers represented on faces more than once, explaining how this affects the likelihood of outcomes
* using spreadsheets to record the outcomes of an activity and calculate the total frequencies of different outcomes, representing these as a fraction; for example, using coloured balls in a bag, drawing one out at a time and recording the colour, replacing them in the bag after each draw
* investigating First Nations Australian children’s instructive games; for example, Diyari koolchee from the Diyari Peoples near Lake Eyre in South Australia, to conduct repeated trials and explore predictable patterns, using digital tools where appropriate
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| **Mathematics – Year 6**  | **Algebra** | create and use algorithms involving a sequence of steps and decisions that use rules to generate sets of numbers; identify, interpret and explain emerging patternsAC9M6A03 | * using an algorithm to create extended number sequences involving rational numbers, using a rule and digital tools, explaining any emerging patterns
* designing an algorithm to model operations, using the concept of input and output, describing and explaining relationships and any emerging patterns; for example, using function machines to model operations and recognising and comparing additive and multiplicative relationships
* designing an algorithm or writing a simple program to generate a sequence of numbers based on the user’s input and a chosen operation, discussing any emerging patterns; for example, generating a sequence of numbers and comparing how quickly the sequences are growing in comparison to each other using the rule adding 2 to the input number compared to multiplying the input number by 2
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|  | **Space** | locate points in the 4 quadrants of a Cartesian plane; describe changes to the coordinates when a point is moved to a different position in the planeAC9M6SP02 | * exploring how coordinates can be used to input positional data for artificial intelligence systems to locate positions in an image or other two-dimensional space
 |
| recognise and use combinations of transformations to create tessellations and other geometric patterns, using dynamic geometric software where appropriateAC9M6SP03 | * designing an algorithm as set of instructions to transform a shape, including getting back to where you started from; for example, programming a robot to move around the plane using instructions for movements, such as 2 down, 3 to the right, and combinations of these to transform shapes
 |
| **Statistics** | interpret and compare data sets for ordinal and nominal categorical, discrete and continuous numerical variables using comparative displays or visualisations and digital tools; compare distributions in terms of mode, range and shapeAC9M6ST01 | * using technology, including AI generative tools, to access data sets and construct side-by-side column graphs or stacked line graphs using graphing software; comparing data sets that are grouped by gender, year level, age group or other variables and discussing findings
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|  |  | identify statistically informed arguments presented in traditional and digital media; discuss and critique methods, data representations and conclusionsAC9M6ST02 | * investigating both traditional and digital media relating to First Nations Australians, identifying and critiquing statistically informed arguments
 |
| **Probability** | recognise that probabilities lie on numerical scales of 0 – 1 or 0% – 100% and use estimation to assign probabilities that events occur in a given context, using common fractions, percentages and decimalsAC9M6P01 | * exploring how probabilities are used in artificial intelligence for machine learning and decision-making; for example, when choosing a video on a streaming service or travelling in a self-driving autonomous car, where artificial intelligence algorithms estimate the probability of a pedestrian crossing the road, which helps the autonomous car make decisions about when to stop or slow down
 |
| conduct repeated chance experiments and run simulations with an increasing number of trials using digital tools; compare observations with expected results and discuss the effect on variation of increasing the number of trialsAC9M6P02 | * using digital tools to simulate multiple tosses of a coin or dice and comparing the relative frequency of an outcome as the number of trials increases; identifying the variation between trials and realising that the results tend to the prediction with larger numbers of trials
* using online simulations of repeated random events to recognise emerging patterns, discussing and comparing expected results to the actual results
* investigating the relative frequencies of all outcomes for a chance experiment and verifying that their sum equals one
* systematically recording the outcome of large numbers of spins on a spinner and analysing the relative frequencies of outcomes, representing these as percentages
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| Years 5 and 6 |
| Key aspect 2: Types of AI |
| Learning area/subject | Strand/sub-strand | Content descriptions | Content elaborations |
| **Digital Technologies** | **Knowledge and understanding**Digital systems | investigate the main internal components of common digital systems and their functionAC9TDI6K01 | * explaining how digital systems are made up of parts that perform specific functions, for example the processor controls the tablet, performs calculations and manipulates data
* exploring how the central processing unit (CPU), memory and input/output components work together to perform a simple calculation
* investigating the main components in a video conferencing system and their functions, for example a telehealth system used to access ultrasound and other imagery services by communities in areas classified as remote such as those of some First Nations Australians
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| examine how digital systems form networks to transmit dataAC9TDI6K02 | * investigating the use of satellite phones where mobile phone networks are not available, inaccessible or unreliable, for example many homeland communities of Arnhem Land have limited access to mainstream communication networks
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| **Design and Technologies** | **Knowledge and understanding**Technologies and society | explain how people in design and technologies occupations consider competing factors including sustainability in the design of products, services and environmentsAC9TDE6K01 | * explaining the importance of aesthetics, function and sustainability in product design, for example a textile product that gives ultraviolet protection and is appealing; an odour-fighting wool fabric that minimises washing; a motor that moves a vehicle and uses a sustainable power source; a modification to a home to reduce environmental impact; restoring a natural environment and enabling low-impact access for the public such as boardwalks in fragile wet heath or swamp ecosystems
* considering how engineers resolve competing factors to produce innovative solutions, for example experimenting with novel ideas such as biomimicry to engineer a solution such as a soft robotic device
* considering how Safety by Design principles have been used in the design of products, services or environments, for example considering how prevention, protection and proactive change can be used to improve safety of designed solutions
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| **Mathematics – Year 5** | **Space** | construct a grid coordinate system that uses coordinates to locate positions within a space; use coordinates and directional language to describe position and movementAC9M5SP02 | * investigating how autonomous vehicles use mapping, GPS systems, communication systems and path planning to navigate within a space
 |
| **Statistics** | acquire, validate and represent data for nominal and ordinal categorical and discrete numerical variables, to address a question of interest or purpose using software including spreadsheets; discuss and report on data distributions in terms of highest frequency (mode) and shape, in the context of the dataAC9M5ST01 | * exploring how travel and online shopping websites and apps collect ordinal data from users to provide customer satisfaction and popularity ratings, and how they use recommendation algorithms to assist customers in travel planning or retail purchasing
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| **Mathematics – Year 6** | **Space** | recognise and use combinations of transformations to create tessellations and other geometric patterns, using dynamic geometric software where appropriateAC9M6SP03 | * designing an algorithm as set of instructions to transform a shape, including getting back to where you started from; for example, programming a robot to move around the plane using instructions for movements, such as 2 down, 3 to the right, and combinations of these to transform shapes
 |
| **Statistics** | interpret and compare data sets for ordinal and nominal categorical, discrete and continuous numerical variables using comparative displays or visualisations and digital tools; compare distributions in terms of mode, range and shapeAC9M6ST01 | * using technology, including AI generative tools, to access data sets and construct side-by-side column graphs or stacked line graphs using graphing software; comparing data sets that are grouped by gender, year level, age group or other variables and discussing findings
 |
| identify statistically informed arguments presented in traditional and digital media; discuss and critique methods, data representations and conclusionsAC9M6ST02 | * investigating both traditional and digital media relating to First Nations Australians, identifying and critiquing statistically informed arguments
 |
| **Probability** | recognise that probabilities lie on numerical scales of 0 – 1 or 0% – 100% and use estimation to assign probabilities that events occur in a given context, using common fractions, percentages and decimalsAC9M6P01 | * exploring how probabilities are used in artificial intelligence for machine learning and decision-making; for example, when choosing a video on a streaming service or travelling in a self-driving autonomous car, where artificial intelligence algorithms estimate the probability of a pedestrian crossing the road, which helps the autonomous car make decisions about when to stop or slow down
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| **Science – Year 5** | **Science inquiry** Planning and conducting | use equipment to observe, measure and record data with reasonable precision, using digital tools as appropriateAC9S5I03 | * exploring which equipment gives the most reasonable precision for the measurements of data required in the investigation
 |
| **Science – Year 6** | **Science inquiry** Planning and conducting | use equipment to observe, measure and record data with reasonable precision, using digital tools as appropriateAC9S6I03 | * using digital tools such as digital thermometers or soil moisture probes to collect data over time and record data in spreadsheets
 |
| **Science as a human endeavour** Nature and development of science | examine why advances in science are often the result of collaboration or build on the work of othersAC9S6H01 | * examining why ecologists collaborate with engineers and computer scientists to develop remote sensing techniques, identify patterns in habitat change and make predictions
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| Years 5 and 6 |
| Key aspect 3: Responsible use and application of AI |
| Learning area/subject | Strand/sub-strand | Content descriptions | Content elaborations |
| **Digital Technologies** | **Processes and production skills**Investigating and defining | define problems with given or co-developed design criteria and by creating user storiesAC9TDI6P01 | * using provided stimulus to identify an issue and writing a user story in groups, for example using a newspaper article to develop a user story, such as: a family in a bushfire or flood-prone environment needs a way to ensure they are prepared in case of an emergency
* discussing possible design criteria based on a stimulus, for example the cost, sustainability and timeliness for a roadside bushfire or flood risk rating system
* investigating the impact that feral animals have on native flora and fauna and how this problem has led to economic development opportunities for groups such as the Arnhem Land Progress Aboriginal Corporation
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| **Processes and production skills**Generating and designing | design a user interface for a digital systemAC9TDI6P03 | * designing a user interface on paper or using digital tools, for example drawing the designed layout of the landing page of an app to order lunches from the school canteen
* designing a user interface to address an identified need, for example including customisable font size and colour contrast to help users who are visually impaired
* modelling how user interfaces allow people from different cultures and language backgrounds to access information, for example using consistent symbols to represent common actions such as copy, paste and save
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| generate, modify, communicate and evaluate designsAC9TDI6P04 | * ideating a range of possible design ideas, discussing them and judging them against the design criteria and user stories, for example using the design criteria to put design ideas in order of preference in a group discussion
* suggesting modifications to the preferred design idea if it does not satisfy all design criteria and user stories, for example modifying a game or game controller so that it can be used by a wider range of players
 |
| **Processes and production skills**Producing and implementing | implement algorithms as visual programs involving control structures, variables and inputAC9TDI6P05 | * writing and editing programs to solve problems using branching, iteration and variables in a visual programming environment, for example writing a program to draw a rotated shape a given number of times using Turtle Graphics
* writing programs that take input from the user or environment and storing that input in a variable for later use, for example asking the user how many shapes to draw in a circle and using that to calculate the number of iterations and angle to rotate each time
* writing programs that make decisions involving multiple alternatives, for example an interactive quiz that checks if the answer is correct, gives feedback and updates the score, or gives a final grade based on the score
* writing programs that repeat multiple steps based on the user's input, for example repeatedly drawing a shape a given number of times, shifting the position between each iteration
* stating the expected behaviour of a program, running the program to check it is correct and fixing any errors, for example 'when I press the left arrow key, the cat should move left, finding the cat moves right, and fixing it by changing the 10 to -10 to alter the direction'
* programming digital systems to perform automated tasks, such as closing gates, for example simulating the work of First Nations Australian rangers attempting to lure and capture feral animals
 |
| **Processes and production skills**Evaluating | evaluate existing and student solutions against the design criteria and user stories and their broader community impactAC9TDI6P06 | * evaluating the effectiveness of their own solutions to address the identified problem from the user stories, for example checking if the information created for the local interactive history walk is relevant and meets the council's needs
* reflecting on the many systems that are used in the wider community to address a range of problems, for example timetables to manage transport and other services through to details such as storing licence information so that police can enforce road rules
* verifying the correctness of AI-generated content against information known to be factually accurate; for example, comparing the output from a generative text model providing a biography of a local leader with the data published on their official website or other authoritative source
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| **Processes and production skills**Collaborating and managing | select and use appropriate digital tools effectively to create, locate and communicate content, applying common conventionsAC9TDI6P07 | * creating achievable steps and timeframes and identifying digital tools needed to produce a solution to a given problem, for example planning what they need to do to create a report on the effectiveness of the school's recycling initiatives
* locating content through search engines and in documents by revising queries and using required search terms, for example reviewing search results and modifying search terms to make the query more accurate
* judging the tone and appropriateness for the intended audience of text generated using autocomplete; for example, deciding that the predictive text was too formal for a conversation with a friend and rewriting it in more casual language
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| select and use appropriate digital tools effectively to share content online, plan tasks and collaborate on projects, demonstrating agreed behavioursAC9TDI6P08 | * defining and acting collectively using online community standards and valuing the work of others, for example moderating language and behaviour in an online class forum, not deleting the work of collaborators, and respecting others’ intellectual property
* demonstrating agreed behaviours; following cultural protocols, including relevant permissions and attributions; acknowledging diversity, capability and strength; and addressing risks and responsibilities such as privacy, security, and accuracy of data; for example when sharing images of First Nations Australians' cultural artefacts
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| **Processes and production skills**Privacy and security | access multiple personal accounts using unique passphrases and explain the risks of password re-useAC9TDI6P09 | * using multiple accounts, each with different passphrases, to access each website or app used for school and home, for example having a different username and password combination for school, gaming and music accounts
* explaining why re-using a password is risky when one of them is found out, for example how a compromised password from one social media account might be able to be used to access their bank or school account if the password is the same and other details are also compromised
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|  |  | explain the creation and permanence of their digital footprint and consider privacy when collecting user dataAC9TDI6P10 | * describing scenarios where data, images or both that have been posted online can lead to information being resurfaced at a later date, for example how a comment made on a social media post or video associates a person with both their comment and the content
* explaining why collecting the smallest amount of data needed for a purpose is important to protect someone's privacy, for example how choosing not to collect information about someone's birthdate when it is not necessary ensures that private data cannot be stolen in a cyber attack
* understanding the implications of how personal data can be used to train generative AI models; for example, sharing personal information increases the likelihood that private information is revealed through AI outputs now and in the future
 |
| **Design and Technologies** | **Knowledge and understanding**Technologies and society | explain how people in design and technologies occupations consider competing factors including sustainability in the design of products, services and environmentsAC9TDE6K01 | * explaining the importance of aesthetics, function and sustainability in product design, for example a textile product that gives ultraviolet protection and is appealing; an odour-fighting wool fabric that minimises washing; a motor that moves a vehicle and uses a sustainable power source; a modification to a home to reduce environmental impact; restoring a natural environment and enabling low-impact access for the public such as boardwalks in fragile wet heath or swamp ecosystems
* considering how engineers resolve competing factors to produce innovative solutions, for example experimenting with novel ideas such as biomimicry to engineer a solution such as a soft robotic device
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| **Mathematics – Year 5** | **Statistics**  | acquire, validate and represent data for nominal and ordinal categorical and discrete numerical variables, to address a question of interest or purpose using software including spreadsheets; discuss and report on data distributions in terms of highest frequency (mode) and shape, in the context of the dataAC9M5ST01 | * exploring how travel and online shopping websites and apps collect ordinal data from users to provide customer satisfaction and popularity ratings, and how they use recommendation algorithms to assist customers in travel planning or retail purchasing
 |
| **Probability** | conduct repeated chance experiments including those with and without equally likely outcomes, observe and record the results; use frequency to compare outcomes and estimate their likelihoodsAC9M5P02 | * experimenting with and comparing the outcomes of spinners with equal-coloured regions compared to unequal regions; responding to questions such as “How does this spinner differ to one where each of the colours has an equal chance of occurring?”, giving reasons
* comparing the results of experiments using a fair dice and one that has numbers represented on faces more than once, explaining how this affects the likelihood of outcomes
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| **Science – Year 6** | **Science inquiry** Planning and conducting | use equipment to observe, measure and record data with reasonable precision, using digital tools as appropriateAC9S6I03 | * using digital tools such as digital thermometers or soil moisture probes to collect data over time and record data in spreadsheets
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| **Science as a human endeavour** Nature and development of science | examine why advances in science are often the result of collaboration or build on the work of othersAC9S6H01 | * examining why ecologists collaborate with engineers and computer scientists to develop remote sensing techniques, identify patterns in habitat change and make predictions
 |