Technology

in the New Zealand Curriculum

We've revised the Technology learning area to strengthen the positioning of digital technologies in the New Zealand Curriculum. The goal of this change is to ensure that all learners have the opportunity to become digitally capable individuals. This change signals the need for greater focus on our students building their skills so they can be innovative creators of digital solutions, moving beyond solely being users and consumers of digital technologies.

Schools will be expected to fully integrate the revised learning area into their curriculum by the start of the 2020 school year.

What is technology about?

Kaua e rangiruatia te hāpai o te hoe;
e kore tō tātou waka e ū ki uta.

Technology is intervention by design. It uses intellectual and practical resources to create technological outcomes, which expand human possibilities by addressing needs and realising opportunities.

Design is characterised by innovation and adaptation and is at the heart of technological practice. It is informed by critical and creative thinking and specific design processes. Effective and ethical design respects the unique relationship that New Zealanders have with their physical environment and embraces the significance of Māori culture and world views in its practice and innovation.

Technology makes enterprising use of knowledge, skills and practices for exploration and communication, some specific to areas within technology and some from other disciplines. These include digitally-aided design, programming, software development, various forms of technological modelling, and visual literacy – the ability to make sense of images and the ability to make images that make sense.

Why study technology?

With its focus on design thinking, technology education supports students to be innovative, reflective and critical in designing new models, products, software, systems and tools to benefit people while taking account of their impact on cultural, ethical, environmental and economic conditions.

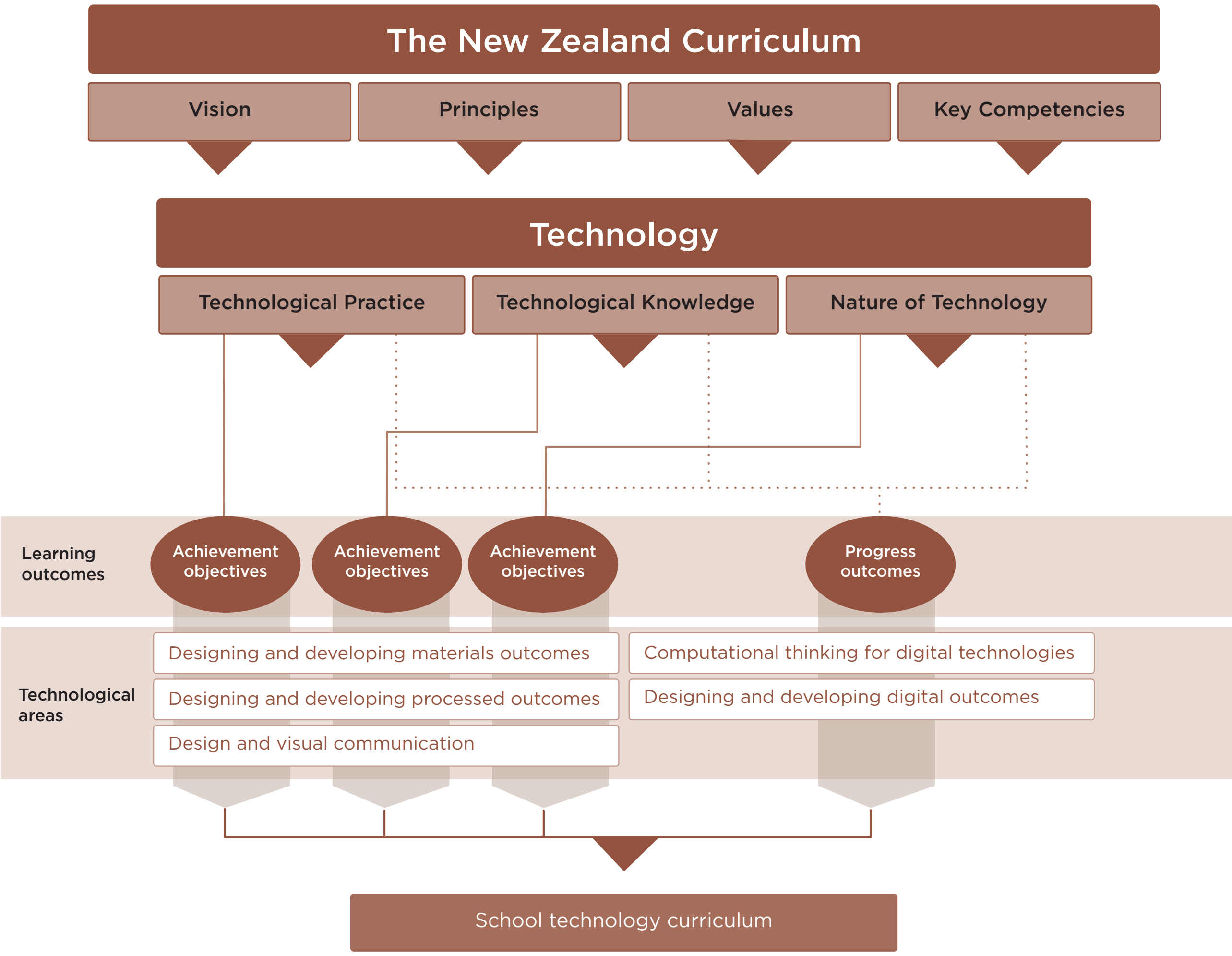
The aim is for students to develop broad technological knowledge, practices and dispositions that will equip them to participate in society as informed citizens and provide a platform for technology-related careers. Students learn that technology is the result of human activity by exploring stories and experiences from their heritage, from Aotearoa New Zealand's rich cultural environment, and from contemporary examples of technology. As they learn in technology, students draw on and further develop the key competencies.

Learning area structure

The technology learning area has three strands: Technological Practice, Technological Knowledge, and Nature of Technology. These three strands are embedded within each of five technological areas:

- computational thinking for digital technologies
- designing and developing digital outcomes
- designing and developing materials outcomes
- designing and developing processed outcomes
- design and visual communication.

The following diagram illustrates the structure of the learning area.



As the diagram shows, the three strands provide the organising structure for achievement objectives used in three of the technological areas (Designing and developing materials outcomes, Designing and developing processed outcomes, Design and visual communication), and they underpin progress outcomes for the other two areas (Computational thinking for digital technologies, Designing and developing digital outcomes).

Strands

Although the three strands are described separately below, in reality they are almost always integrated in teaching and learning programmes.

In **Technological Practice**, students examine the practice of others and undertake their own. They develop a range of outcomes, including concepts, plans, briefs, technological models, and fully realised products or systems. Students investigate issues and existing outcomes and use the understandings gained, together with design principles and approaches, to inform their own practice. They also learn to consider ethics, legal requirements, protocols, codes of practice, and the needs of and potential impacts on stakeholders and the environment.

Students develop **Technological Knowledge** particular to technological enterprises and environments and in relation to how and why things work. They learn how functional modelling is used to evaluate design ideas and how prototyping is used to evaluate the fitness for purpose of systems and products as they are developed. An understanding of material properties, uses and development is essential to understanding how and why products work the way they do. Similarly, an understanding of the constituent parts of systems and how these work together is essential to understanding how and why systems operate in the way they do.

For the **Nature of Technology**, students develop an understanding of technology as a discipline and of how it differs from other disciplines. They learn to critique the impact of technology on societies and the environment and to explore how developments and outcomes are valued by different peoples in different times. As they do so, they come to appreciate the socially embedded nature of technology and become increasingly able to engage with current and historical issues and to explore future scenarios.

Technological areas

The technological areas provide contexts for learning. At primary school, teachers will generally take a cross-curricular approach, with students learning in the technological areas as part of a topic or theme that encompasses several curriculum learning areas. This approach can also be applied in years 9 and 10, before students begin to specialise in particular technological areas.

Digital technologies

The first two of the five technological areas focus on developing students' capability to create digital technologies for specific purposes. In years 1–8, these two areas are usually implemented within other curriculum learning areas, integrating technology outcomes with the learning area outcomes.
These two areas also significantly contribute to students developing the knowledge and skills they need as digital citizens and as users of digital technologies across the curriculum. They also provide opportunities to further develop their key competencies.

By the end of year 10, students' digital technological knowledge and skills enable them to follow a predetermined process to design, develop, store, test and evaluate digital content to address a given issue. Throughout this process, students take into account immediate social and end-user considerations.
They can independently decompose a computational problem into an algorithm that they use to create a program incorporating inputs, outputs, sequence, selection and iteration. They understand the role of systems in managing digital devices, security and application software, and they are able to apply file management conventions using a range of storage devices.

By the end of year 13, students who have specialised in digital technologies will design and develop fit-for-purpose digital outcomes, drawing on their knowledge of a range of digital applications and systems and taking into account a synthesis of social, ethical and end-user considerations. They understand how areas of computer science such as network communication protocols and artificial intelligence are underpinned by algorithms, data representation and programming, and they analyse how these are synthesised in real world applications. They use accepted software engineering methodologies to design, develop, document and test complex computer programs.

Computational thinking for digital technologies

Computational thinking enables students to express problems and formulate solutions in ways that means a computer (an information processing agent) can be used to solve them.

In this area, students develop algorithmic thinking skills and an understanding of the computer science principles that underpin all digital technologies. They become aware of what is and isn't possible with computing, allowing them to make judgments and informed decisions as citizens of the digital world.

Students learn core programming concepts and how to take advantage of the capabilities of computers, so that they can become creators of digital technologies, not just users. They develop an understanding of how computer data is stored, how all the information within a computer system is presented using digits, and the impact that different data representations have on the nature and use of this information.

Designing and developing digital outcomes

In this area, students understand that digital applications and systems are created for humans by humans. They develop increasingly sophisticated understandings and skills for designing and producing quality, fit-for-purpose, digital outcomes. They develop their understanding of the technologies people need in order to locate, analyse, evaluate and present digital information efficiently, effectively and ethically.

Students become more expert in manipulating and combining data, using information management tools to create an outcome. They become aware of the unique intellectual property issues that arise in digital systems, particularly with approaches to copyright and patents. They also develop understandings of how to build, install, and maintain computers, networks and systems so that they are secure and efficient.

Students develop knowledge and skills in using different technologies to create digital content for the web, interactive digital platforms and print. They construct digital media outcomes that integrate media types and incorporate original content. They also learn how electronic components and techniques are used to design digital devices and integrated to assemble and test an electronic environment.

Designing and developing materials outcomes

In this area, students develop knowledge and skills that enable them to form, transform and work with resistant materials, textiles and fashion. This allows them to create both conceptual and prototypic technological outcomes that solve problems and satisfy needs and opportunities. They develop knowledge about the systems, structures, machines and techniques used in manufacturing products, and they use manufacturing and quality assurance processes to produce prototypes and batches of a product.

Students' thinking becomes more and more reflective, critical and creative as they assess and critique materials outcomes in terms of quality of design, fitness for purpose, and impact and influence on society and the environment. Students become increasingly skilled in applying their knowledge of design principles to create innovative outcomes that realise opportunities and solve real-world problems.

Designing and developing processed outcomes

In this area, students develop knowledge of the materials and ingredients used to formulate food, chemical and biotechnological products. They form, transform and manipulate materials or ingredients to develop conceptual, prototypic and final technological outcomes that will meet the needs of an increasingly complex society.

Students engage in a range of processes related to food technology, biotechnology, chemical technology and agricultural technologies. They explore the impact of different economic and cultural concepts on the development of processed products, including their application in product preservation, packaging and storage. They also develop understandings of the systems, processes and techniques used in manufacturing products and gain experience from using these, along with related quality assurance procedures, to produce prototypes or multiple copies of a product.

Students demonstrate increasingly critical, reflective and creative thinking as they evaluate and critique technological outcomes in terms of the quality of their design, their fitness for purpose and their wider impacts. They become more and more skilled in applying their knowledge of design principles to create desired, feasible outcomes that resolve real-world issues.

Design and visual communication

In this area, students learn to apply design thinking. They develop an awareness of design by using visual communication to conceptualise and develop design ideas in response to a brief. In doing so, they develop visual literacy: the ability to make sense of images and the ability to make images that make sense. They apply their visual literacy through using sketching, digital modes and other modelling techniques to effectively communicate and present design ideas.

Students learn that designers identify the qualities and potential of design ideas in terms of the broad principles of design (aesthetics and function) and of sustainability. They also understand that designers are influenced by human, societal, environmental, historical and technological factors.

Learning pathways

Over the course of years 1–10, students learn in all five technological areas, developing their knowledge and skills in context. By offering a variety of contexts, teachers help their students to recognise links between technological areas. Students should be encouraged to access relevant knowledge and skills from other learning areas and to build on their developing key competencies.

Work towards progress outcomes in *computational thinking for digital technologies* and *designing and developing digital outcomes* should build each year in order to ensure learners achieve all of the significant learning steps.

In years 11–13, students work with fewer contexts in greater depth. This requires them to continue to draw fully on learning from other disciplines. For example, students working with materials and/or food technology will need to refer to chemistry, and students working on an architectural project will find that an understanding of art history is invaluable. Some schools may offer courses such as electronics and horticultural science as technology specialisations.

Learning for senior students opens up pathways that can lead to technology-related careers. Students may access workplace learning opportunities available in a range of industries or move on to further specialised tertiary study.

Achievement objectives

Level 1

Technological Practice

Students will:

Planning for practice

- Outline a general plan to support the development of an outcome, identifying appropriate steps and resources.

Brief development

- Describe the outcome they are developing and identify the attributes it should have, taking account of the need or opportunity and the resources available.

Outcome development and evaluation

- Investigate a context to communicate potential outcomes. Evaluate these against attributes; select and develop an outcome in keeping with the identified attributes.

Technological Knowledge

Students will:

Technological modelling

- Understand that functional models are used to represent reality and test design concepts and that prototypes are used to test technological outcomes.

Technological products

- Understand that technological products are made from materials that have performance properties.

Technological systems

- Understand that technological systems have inputs, controlled transformations, and outputs.

Nature of Technology

Students will:

Characteristics of technology

- Understand that technology is purposeful intervention through design.

Characteristics of technological outcomes

- Understand that technological outcomes are products or systems developed by people and have a physical nature and a functional nature.

Level 2

Technological Practice

Students will:

Planning for practice

- Develop a plan that identifies the key stages and the resources required to complete an outcome.

Brief development

- Explain the outcome they are developing and describe the attributes it should have, taking account of the need or opportunity and the resources available.

Outcome development and evaluation

- Investigate a context to develop ideas for potential outcomes. Evaluate these against the identified attributes, select, and develop an outcome. Evaluate the outcome in terms of the need or opportunity.

Technological Knowledge

Students will:

Technological modelling

- Understand that functional models are used to explore, test, and evaluate design concepts for potential outcomes and that prototyping is used to test a technological outcome for fitness of purpose.

Technological products

- Understand that there is a relationship between a material used and its performance properties in a technological product.

Technological systems

- Understand that there are relationships between the inputs, controlled transformations, and outputs occurring within simple technological systems.

Nature of Technology

Students will:

Characteristics of technology

- Understand that technology both reflects and changes society and the environment and increases people's capability.

Characteristics of technological outcomes

- Understand that technological outcomes are developed through technological practice and have related physical and functional natures.

Level 3

Technological Practice

Students will:

Planning for practice

- Undertake planning to identify the key stages and resources required to develop an outcome. Revisit planning to include reviews of progress and identify implications for subsequent decision making.

Brief development

- Describe the nature of an intended outcome, explaining how it addresses the need or opportunity. Describe the key attributes that enable development and evaluation of an outcome.

Outcome development and evaluation

- Investigate a context to develop ideas for potential outcomes. Trial and evaluate these against key attributes to select and develop an outcome to address the need or opportunity. Evaluate this outcome against the key attributes and how it addresses the need or opportunity.

Technological Knowledge

Students will:

Technological modelling

- Understand that different forms of functional modelling are used to inform decision making in the development of technological possibilities and that prototypes can be used to evaluate the fitness of technological outcomes for further development.

Technological products

- Understand the relationship between the materials used and their performance properties in technological products.

Technological systems

- Understand that technological systems are represented by symbolic language tools and understand the role played by the “black box” in technological systems.

Nature of Technology

Students will:

Characteristics of technology

- Understand how society and environments impact on and are influenced by technology in historical and contemporary contexts and that technological knowledge is validated by successful function.

Characteristics of technological outcomes

- Understand that technological outcomes are recognisable as fit for purpose by the relationship between their physical and functional natures.

Level 4

Technological Practice

Students will:

Planning for practice

- Undertake planning that includes reviewing the effectiveness of past actions and resourcing, exploring implications for future actions and accessing of resources, and consideration of stakeholder feedback, to enable the development of an outcome.

Brief development

- Justify the nature of an intended outcome in relation to the need or opportunity. Describe the key attributes identified in stakeholder feedback, which will inform the development of an outcome and its evaluation.

Outcome development and evaluation

- Investigate a context to develop ideas for feasible outcomes. Undertake functional modelling that takes account of stakeholder feedback in order to select and develop the outcome that best addresses the key attributes. Incorporating stakeholder feedback, evaluate the outcome’s fitness for purpose in terms of how well it addresses the need or opportunity.

Technological Knowledge

Students will:

Technological modelling

- Understand how different forms of functional modelling are used to explore possibilities and to justify decision making and how prototyping can be used to justify refinement of technological outcomes.

Technological products

- Understand that materials can be formed, manipulated, and/or transformed to enhance the fitness for purpose of a technological product.

Technological systems

- Understand how technological systems employ control to allow for the transformation of inputs to outputs.

Nature of Technology

Students will:

Characteristics of technology

- Understand how technological development expands human possibilities and how technology draws on knowledge from a wide range of disciplines.

Characteristics of technological outcomes

- Understand that technological outcomes can be interpreted in terms of how they might be used and by whom and that each has a proper function as well as possible alternative functions.

Level 5

Technological Practice

Students will:

Planning for practice

- Analyse their own and others' planning practices to inform the selection and use of planning tools. Use these to support and justify planning decisions (including those relating to the management of resources) that will see the development of an outcome through to completion.

Brief development

- Justify the nature of an intended outcome in relation to the need or opportunity. Describe specifications that reflect key stakeholder feedback and that will inform the development of an outcome and its evaluation.

Outcome development and evaluation

- Analyse their own and others' outcomes to inform the development of ideas for feasible outcomes. Undertake ongoing functional modelling and evaluation that takes account of key stakeholder feedback and trialling in the physical and social environments. Use the information gained to select and develop the outcome that best addresses the specifications. Evaluate the final outcome's fitness for purpose against the brief.

Technological Knowledge

Students will:

Technological modelling

- Understand how evidence, reasoning, and decision making in functional modelling contribute to the development of design concepts and how prototyping can be used to justify ongoing refinement of outcomes.

Technological products

- Understand how materials are selected, based on desired performance criteria.

Technological systems

- Understand the properties of subsystems within technological systems.

Nature of Technology

Students will:

Characteristics of technology

- Understand how people's perceptions and acceptance of technology impact on technological developments and how and why technological knowledge becomes codified.

Characteristics of technological outcomes

- Understand that technological outcomes are fit for purpose in terms of time and context. Understand the concept of malfunction and how "failure" can inform future outcomes.

Level 6

Technological Practice

Students will:

Planning for practice

- Critically analyse their own and others' past and current planning practices in order to make informed selection and effective use of planning tools. Use these to support and justify ongoing planning that will see the development of an outcome through to completion.

Brief development

- Justify the nature of an intended outcome in relation to the need or opportunity and justify specifications in terms of key stakeholder feedback and wider community considerations.

Outcome development and evaluation

- Critically analyse their own and others' outcomes to inform the development of ideas for feasible outcomes. Undertake ongoing experimentation and functional modelling, taking account of stakeholder feedback and trialling in the physical and social environments. Use the information gained to select, justify, and develop a final outcome. Evaluate this outcome's fitness for purpose against the brief and justify the evaluation using feedback from stakeholders.

Technological Knowledge

Students will:

Technological modelling

- Understand the role and nature of evidence and reasoning when managing risk through technological modelling.

Technological products

- Understand how materials are formed, manipulated, and transformed in different ways, depending on their properties, and understand the role of material evaluation in determining suitability for use in product development.

Technological systems

- Understand the implications of subsystems for the design, development, and maintenance of technological systems.

Nature of Technology

Students will:

Characteristics of technology

- Understand the interdisciplinary nature of technology and the implications of this for maximising possibilities through collaborative practice.

Characteristics of technological outcomes

- Understand that some technological outcomes can be perceived as both product and system. Understand how these outcomes impact on other outcomes and practices and on people's views of themselves and possible futures.

Level 7

Technological Practice

Students will:

Planning for practice

- Critically analyse their own and others' past and current planning and management practices in order to develop and employ project management practices that will ensure the effective development of an outcome to completion.

Brief development

- Justify the nature of an intended outcome in relation to the issue to be resolved and justify specifications in terms of key stakeholder feedback and wider community considerations.

Outcome development and evaluation

- Critically analyse their own and others' outcomes and evaluative practices to inform the development of ideas for feasible outcomes. Undertake a critical evaluation that is informed by ongoing experimentation and functional modelling, stakeholder feedback, and trialling in the physical and social environments. Use the information gained to select, justify, and develop an outcome. Evaluate this outcome's fitness for purpose against the brief. Justify the evaluation, using feedback from stakeholders and demonstrating a critical understanding of the issue.

Technological Knowledge

Students will:

Technological modelling

- Understand how the "should" and "could" decisions in technological modelling rely on an understanding of how evidence can change in value across contexts and how different tools are used to ascertain and mitigate risk.

Technological products

- Understand the concepts and processes employed in materials evaluation and the implications of these for design, development, maintenance, and disposal of technological products.

Technological systems

- Understand the concepts of redundancy and reliability and their implications for the design, development, and maintenance of technological systems.

Nature of Technology

Students will:

Characteristics of technology

- Understand the implications of ongoing contestation and competing priorities for complex and innovative decision making in technological development.

Characteristics of technological outcomes

- Understand that technological outcomes are a resolution of form and function priorities and that malfunction affects how people view and accept outcomes.

Level 8

Technological Practice

Students will:

Planning for practice

- Critically analyse their own and others' past and current planning and management practices in order to develop and employ project management practices that will ensure the efficient development of an outcome to completion.

Brief development

- Justify the nature of an intended outcome in relation to the context and the issue to be resolved. Justify specifications in terms of key stakeholder feedback and wider community considerations.

Outcome development and evaluation

- Critically analyse their own and others' outcomes and fitness-for-purpose determinations in order to inform the development of ideas for feasible outcomes. Undertake a critical evaluation that is informed by ongoing experimentation and functional modelling, stakeholder feedback, trialling in the physical and social environments, and an understanding of the issue as it relates to the wider context. Use the information gained to select, justify, and develop an outcome. Evaluate this outcome's fitness for purpose against the brief. Justify the evaluation, using feedback from stakeholders and demonstrating a critical understanding of the issue that takes account of all contextual dimensions.

Technological Knowledge

Students will:

Technological modelling

- Understand the role of technological modelling as a key part of technological development, justifying its importance on moral, ethical, sustainable, cultural, political, economic, and historical grounds.

Technological products

- Understand the concepts and processes employed in materials development and evaluation and the implications of these for design, development, maintenance, and disposal of technological products.

Technological systems

- Understand operational parameters and their role in the design, development, and maintenance of technological systems.

Nature of Technology

Students will:

Characteristics of technology

- Understand the implications of technology as intervention by design and how interventions have consequences, known and unknown, intended and unintended.

Characteristics of technological outcomes

- Understand how technological outcomes can be interpreted and justified as fit for purpose in their historical, cultural, social, and geographical location.

Progress outcomes

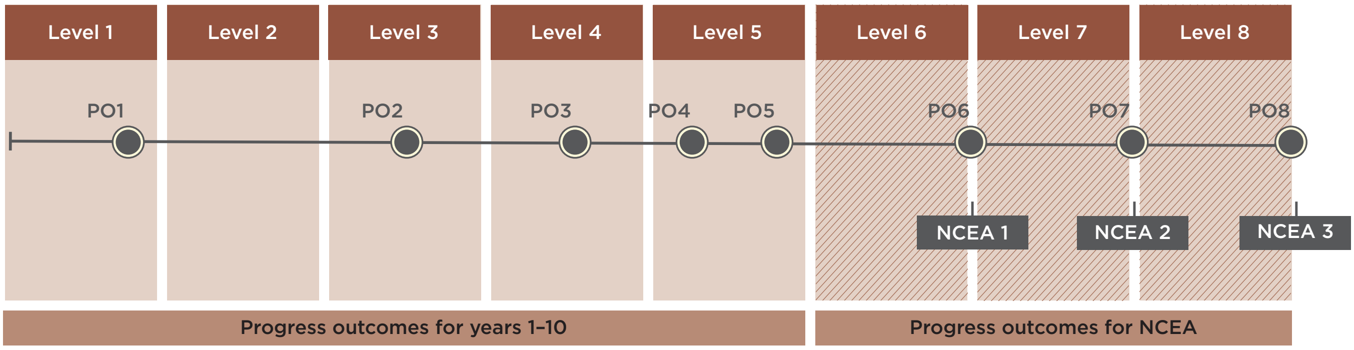
Computational thinking for digital technologies

The progress outcomes describe the significant learning steps that students take as they develop their expertise in computational thinking for digital technologies.

The diagram below shows the alignment between levels 1–5 of the New Zealand Curriculum and the progress outcomes for computational thinking. The uneven spacing of the progress outcomes reflects the different learning and time required for each outcome and is based on data collected during the development of the digital learning progressions.

Progress outcomes 6–8 set out the learning expected for students engaging in more intensive and specialised digital technologies programmes for NCEA 1, 2 and 3. For this reason, they are directly aligned with levels 6–8 of the curriculum.

Computational thinking for digital technologies



The alignment to levels 1–5 of the New Zealand Curriculum (NZC)is tentative and theoretically derived until teachers have had the opportunity to implement the digital progressions.

Progress outcome 1

In authentic contexts and taking account of end-users, students use their decomposition skills to break down simple non-computerised tasks into precise, unambiguous, step-by-step instructions (algorithmic thinking). They give these instructions, identify any errors in them as they are followed, and correct them (simple debugging).

Progress outcome 2

In authentic contexts and taking account of end-users, students give, follow and debug simple algorithms in computerised and non-computerised contexts. They use these algorithms to create simple programs involving outputs and sequencing (putting instructions one after the other) in age-appropriate programming environments.

Progress outcome 3

In authentic contexts and taking account of end-users, students decompose problems into step-by-step instructions to create algorithms for computer programs. They use logical thinking to predict the behaviour of the programs, and they understand that there can be more than one algorithm for the same problem. They develop and debug simple programs that use inputs, outputs, sequence and iteration (repeating part of the algorithm with a loop). They understand that digital devices store data using just two states represented by binary digits (bits).

Progress outcome 4

In authentic contexts and taking account of end-users, students decompose problems to create simple algorithms using the three building blocks of programing: sequence, selection, and iteration. They implement these algorithms by creating programs that use inputs, outputs, sequence, basic selection using comparative operators, and iteration. They debug simple algorithms and programs by identifying when things go wrong with their instructions and correcting them, and they are able to explain why things went wrong and how they fixed them.

Students understand that digital devices represent data with binary digits and have ways of detecting errors in data storage and transmission. They evaluate the efficiency of algorithms, recognising that computers need to search and sort large amounts of data. They also evaluate user interfaces in relation to their efficiency and usability.

Progress outcome 5

In authentic contexts and taking account of end-users, students independently decompose problems into algorithms. They use these algorithms to create programs with inputs, outputs, sequence, selection using comparative and logical operators and variables of different data types, and iteration. They determine when to use different types of control structures.

Students document their programs, using an organised approach for testing and debugging. They understand how computers store more complex types of data using binary digits, and they develop programs considering human-computer interaction (HCI) heuristics.

Progress outcome 6

In authentic contexts and taking account of end-users, students determine and compare the "cost" (computational complexity) of two iterative algorithms for the same problem size. They understand the concept of compression coding for different media types, its typical uses, and how it enables widely used technologies to function.

Students use an iterative process to design, develop, document and test basic computer programs. They apply design principles and usability heuristics to their own designs and evaluate user interfaces in terms of them.

Progress outcome 7

In authentic contexts and taking account of end-users, students analyse concepts in digital technologies (e.g., information systems, encryption, error control, complexity and tractability, autonomous control) by explaining the relevant mechanisms that underpin them, how they are used in real world applications, and the key problems or issues related to them.

Students discuss the purpose of a selection of data structures and evaluate their use in terms of trade-offs between performance and storage requirements and their suitability for different algorithms. They use an iterative process to design, develop, document and test advanced computer programs.

Progress outcome 8

In authentic contexts and taking account of end-users, students evaluate concepts in digital technologies (e.g., formal languages, network communication protocols, artificial intelligence, graphics and visual computing, big data, social algorithms) in relation to how key mechanisms underpin them and how they are applied in different scenarios when developing real world applications.

Students understand accepted software engineering methodologies and user experience design processes and apply their key concepts to design, develop, document and test complex computer programs.

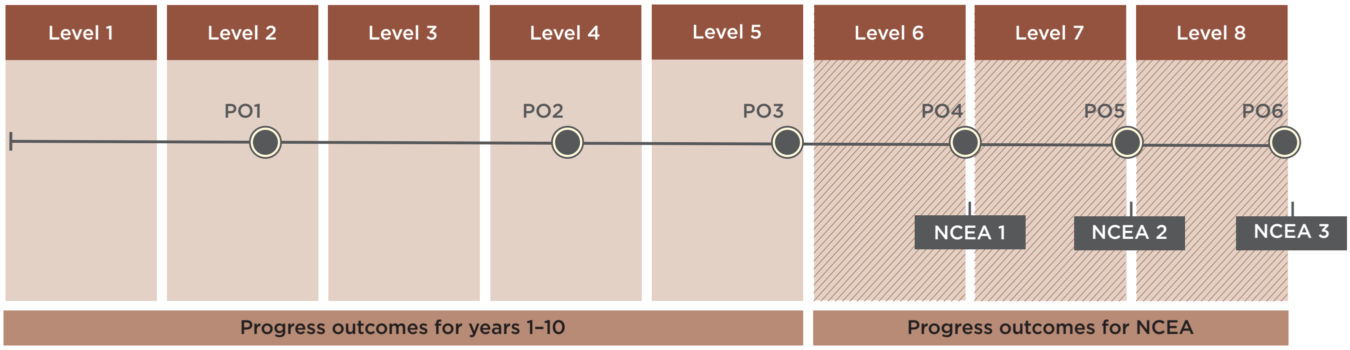
Designing and developing digital outcomes

The progress outcomes describe the significant learning steps that students take as they develop their expertise in designing and developing digital outcomes.

The diagram below shows the alignment between levels 1–5 of the New Zealand Curriculum and the progress outcomes for designing and developing digital outcomes. The uneven spacing of the progress outcomes reflects the different learning and time required for each outcome and is based on data collected during the development of the digital learning progressions.

Progress outcomes 4–6 set out the learning expected for students engaging in more intensive and specialised digital technologies programmes for NCEA 1, 2 and 3. For this reason, they are directly aligned with levels 6–8 of the curriculum.

Designing and developing digital outcomes



The alignment to levels 1–5 of the New Zealand Curriculum (NZC)is tentative and theoretically derived until teachers have had the opportunity to implement the digital progressions.

Progress outcome 1

In authentic contexts and taking account of end-users, students participate in teacher-led activities to develop, manipulate, store, retrieve and share digital content in order to meet technological challenges. In doing so, they identify digital devices and their purposes and understand that humans make them. They know how to use some applications, they can identify the inputs and outputs of a system, and they understand that digital devices store content, which can be retrieved later.

Progress outcome 2

In authentic contexts and taking account of end-users, students make decisions about creating, manipulating, storing, retrieving, sharing and testing digital content for a specific purpose, given particular parameters, tools, and techniques. They understand that digital devices impact on humans and society and that both the devices and their impact change over time.

Students identify the specific role of components in a simple input-process-output system and how they work together, and they recognise the "control role" that humans have in the system. They can select from an increasing range of applications and file types to develop outcomes for particular purposes.

Progress outcome 3

In authentic contexts, students follow a defined process to design, develop, store, test and evaluate digital content to address given contexts or issues, taking into account immediate social, ethical and end-user considerations. They identify the key features of selected software and choose the most appropriate software and file types to develop and combine digital content.

Students understand the role of operating systems in managing digital devices, security, and application software and are able to apply file management conventions using a range of storage devices. They understand that with storing data comes responsibility for ensuring security and privacy.

Progress outcome 4

In authentic contexts, students investigate and consider possible solutions for a given context or issue. With support, they use an iterative process to design, develop, store and test digital outcomes, identifying and evaluating relevant social, ethical and end-user considerations. They use information from testing and apply appropriate tools, techniques, procedures and protocols to improve the quality of the outcomes and to ensure they are fit-for-purpose and meet end-user requirements.

Progress outcome 5

In authentic contexts and with support, students investigate a specialised digital technologies area (e.g., digital media, digital information, electronic environments, user experience design, digital systems) and propose possible solutions to issues they identify. They independently apply an iterative process to design, develop, store and test digital outcomes that enable their solutions, identifying, evaluating, prioritising and responding to relevant social, ethical and end-user considerations. They use information from testing and, with increasing confidence, optimise tools, techniques, procedures and protocols to improve the quality of the outcomes. They apply evaluative processes to ensure the outcomes are fit-for-purpose and meet end-user requirements.

Progress outcome 6

In authentic contexts, students independently investigate a specialised digital technologies area and propose possible solutions to issues they identify. They work independently or within collaborative, cross-functional teams to apply an iterative development process to plan, design, develop, test and create quality, fit-for-purpose digital outcomes that enable their solutions, synthesising relevant social, ethical and end-user considerations as they develop digital content.

Students integrate in the outcomes they develop specialised knowledge of digital applications and systems from a range of areas, including: network architecture; complex electronics environments and embedded systems; interrelated computing devices, hardware and applications; digital information systems; user experience design; complex management of digital information; and creative digital media.