Technology Glossary | He Papakupu Hangarau

Developed by Technology Education New Zealand for use with the New Zealand Curriculum

Notes:
This Glossary is an evolving document and will be updated to align with curriculum changes.

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It is important to note here that Technology and Hangarau are separate and distinct Learning Areas, so, when we are translating Technology as Hangarau, we are saying: English-medium Technology, or Hangarau ki te taha auraki.

Te reo Māori translations have been sourced from paekupu.co.nz or with guidance from Ruth Lemon, using sources including *Māori Dictionary nā John Moorfield, Papakupu: Te Huarahi Māori nā Hēmi Dale*, and *Papakupu Hangarau Matihiko nā Ian Cormack*. Some of the terms will evolve over time, and may be updated by Te Taura Whiri.

Index

A

- accepted conventions - tikanga arowhānui
- aesthetics - āhuatanga rerehua
- algorithm - hātape
- analyse - tātari
- annotate (annotation) - kupu tāpiri
- anthropometric data - raraunga ine tinana
- array - tūtohi tukutuku
- attribute - āhuatanga
- attributes and specifications - āhuatanga me ngā tautuhinga
- authentic context - he horopaki tūturu

B

- black box - pūnaha whakapeke
- block-based programming - tuhiwaehere ā-paraka
- brainstorm - ohia manomano
- brief - mahere
- brief development - whanake mahere

C

- Characteristics of technological outcomes - Ngā āhuatanga o ngā otinga hangarau
- Characteristics of technology - Ngā āhuatanga o te hangarau
- communicative model (visually) - anga whakawhitiwhiti-ā-ataata
- competing priorities - whakaarotau tauwhāinga
- complex - pīroiroi
- complex systems - ngā pūnaha pīroiroi
- component - waehanga
- Computer Aided Design (CAD) - Hoahoa ā-rorohiko
- Computer Aided Manufacture (CAM) - Whakanao ā-rorohiko
- computer model - he tauira matihiko
- Computer Numerical Control (CNC) - Te whakanao mā te whakatina ā-rorohiko
- conceptual design - hoahoa ariā
- conceptual statement - tauākī mō te ariā
- confidentiality agreement - kirimana matatupu
- connection technologies - ngā hangarau tūhonohono
- constraint - aukatinga
- Construction and mechanical technologies - Ngā hangarau hanganui me te pūhanga
- context - horopaki
- control mechanism - pūrere whakahaere
- convergent design thinking - whakaaro hoahoa rūnā
- copyright - manatārua
- create - arotake.
- creative and critical thinking - whakaaro auaha me te arohaehae
- critical evaluation - arotake arohaehae
- critical review points - wā arotake arohaehae
- cutting list - rārangi whakanao

D

- deconstruct - wetewete
- define - tautuhi
- derive - tohutoro
- describe - whakaahua
- design brief - mahere hoahoa
- design elements - āhuatanga hoahoa
- design era - takiwā hoahoa
- design ideas - whakaaro hoahoa
- design judgements - whakataunga hoahoa
- design principles - mātāpono hoahoa
- design thinking - anga whakaaro hoahoa
- develop - whanaketanga
- Digital technologies - Hangarau matihiko
- discipline - pekanga mātauranga
- discuss - matapaki
- divergent design thinking - whakaaro hoahoa roha
- drawing conventions - tikanga tā

E

- empathise - ngākau aroha
- end-user - kaiwhakamahi mutunga
- engineering - mātai pūhanga
- ensure - tāu i mahi ai [kia]...
- environment - taiao
  - electronic environments - ao tāhiko
  - physical environment - ao ōkiko
  - social environment - ao pāpori
  - socio-cultural environment - ao ahurea
  - socio-technological environment - ao hangarau
- ergonomics - mātai arotau
- evaluate - arotake
- explain - whakamārama
- explore - tūhura

F

- feasible - ka whaihua
- feedback - whakahoki (kōrero)
- feedback loop - whakahokinga whakatina
- field of technology - mātai hangarau
- fit for purpose - whaitake
- flow diagram - hoahoa rerenga, hoahoa ripo
- Food technology - Hangarau kai
- function (1) - āheinga
  - proper function - āheinga matua
  - alternative function - āheinga tuarua
- function (2) - taumahi
- functional attribute - āhuatanga āheinga tuarua
- functional characteristics - āhuatanga āheinga matua
- functional modelling - whakatauira i ngā āheinga
- functional qualities - te whakaine i te painga o ngā āhuatanga āheinga
- functional reasoning - te wetewete i ngā āheinga

G

- Gantt chart - Kauwhata pou Gantt
- graphic organiser - tātaitanga whakaahua
- graphical user interface (GUI) - tāhono kaiwhakamahi whakairoiro
- graphics practise - hoahoa whakawai
- guide - aratohu

H

- HACCP - Te Mahere Arotake i ngā Wāhi Pūmate Matua
- hedonic scale - āwhata e whakaine i te āhuareka
- heuristic- he tikanga whakaoti rapanga
- human factors in design - ngā take tangata i ngā mahi hoahoa

I

- ideate - te whakaputa whakaaro
- identify - tautohu
- inquiry - ako pakirehua
- in situ - taunga taketake
- Indicators of Progression - Ngā Paetohu Kokenga
- intellectual property right - mana whakairo hinengaro

intelligent system - pūnaha mōhio
intermediate outcomes - tauira o te otinga
intervention by design - mā te hoahoa ka whakaea
issue - take
iteration - tukurua

J

justify - parahau

K

key stages - kōeke matua

L

legal responsibilities - haepapa ā-ture
local curriculum - marautanga haukāinga
loop - koromeke

M

Makerspace - Wāhi Waihanga
malfunction - [kei te] hapa
manufacturing processes - tukanga whakanao
marking out - whakawhitinga o tētahi hoahoa
material evaluation - te arotake i ngā rawa
measurement - subjective & objective - inenga - taparoto me te tapatahi
mental model - whakaahua ā-hinengaro
mind map - mahere huatau
mitigate risk - whakamaurutanga o ngā tūraru
mockup - tauira iti (he wāhanga o tētahi otinga)
model - tauira
modes of production - ngā momo tukanga whakanao
modify - whakakē
mood board - papa piropiro

N

Nature of technology - Ngā āhuatanga o te hangarau
need - matea
notice -

O

operational parameters - tawhā taumahi
opportunity - wātea
optimise - whakamarohi (computing)
outcome - otinga
Outcome development and evaluation - te whakawhanake me te arotake i ngā otinga hangarau

P

parity bit - moka pūrite
patent - mana waihanga
performance properties - āhuatanga tutukinga
ping - iatare
plan of action - mahere mahi
Planning for practice - whakamahere mō te whakaharatau
planning tools - ngā taputapu whakamahere
practical reasoning - te wetewete i ngā whakataunga
problem decomposition - wāwahinga wero
proposal - whakatakoto
prototype - tauira whakamātau
provide - homai/hoatu
pseudocode - waehere-kikoika

Q

quality check - hihira i te kounga
query - uiui

R

rapid prototyping - te whakaputa tere i ngā tauira whakamātau
reasoned decision-making - te āta whakatau i ngā whakataunga
recipe - tohutao
redundancy - tāweretanga
reflective journal - hautaka huritao
registered designs - ngā hoahoa kua rēhitangia
reliability - pono
remote data packet exchange - whakawhitinga mamao o ngā pākete raraunga
research - rangahau
resistant materials - rawa kaha papare
resources - rauemi
risk - tūraru
rongoā Māori
rubric - mahere paearu kounga

S

safety plan - ngā whakaritenga haumaru
scheduling - tuhi hōtaka
school curriculum - marau-ā-kura
source code - waehere pūtake
spatial design - hoahoa mokowā
special features - āhuatanga motuhake
specification - tautuhinga
sprite - hākoritanga
stakeholder - hunga whaipānga
- Key stakeholders (primary) - hunga whaipānga matua
- Wider community stakeholders (secondary) - hunga whaipānga tuarua

STEM (Science, Technology, Engineering and Mathematics) - PŪRAU (Pūtaiao, Hangarau, Pūhanga me te Pāngarau)
strand - whenu
subjective techniques - rautaki taparoto
support - tautoko
sustainability - toitūtanga

T

Technological knowledge - mātauranga hangarau
technological literacy - mātau hangarau
technological modelling - te whakaputa i ngā tauira hangarau
technological outcome - otinga hangarau
technological practice - whakaharatau hangarau
technological products - hua hangarau
technological solution - otinga hangarau
technological systems (1) - pūnaha hangarau
technological systems (2) - pūnaha hangarau
technology education - akoranga hangarau
testing & trialling - whakamātau
text-based programming - waehere ā-kuputuhi
tinkering - tutū / raweke
trade secret - whakapeke tauhokohoko
trademark - mokopahiki
transformation processes - tukanga panoni

U

usability - ratarata-kaiwhakamahi
usability testing - te whakamātau i te whakamahinga
user-centred design - te hoahoa mō te kaiwhakamahi mutunga

V

variables - taurangi

A

accepted conventions - *tikanga arowhānui*

Accepted conventions are the principles, techniques, and/or procedures established by people within a community of practice. For example, in the construction community, accepted conventions relate to such things as flush, parallel, perpendicular, offset, tolerance, and clearances.

aesthetics - *āhuatanga rerehua*

Aesthetics are a set of principles concerned with the nature and appreciation of beauty. In design, aesthetics refers to how the visual and sensory elements of a product, space, or system are thoughtfully combined to create an appealing and engaging experience. Aesthetics are subjective and influenced by personal, cultural, and environmental factors, guiding how people emotionally and visually connect with a design.

algorithm - *hātape*

Algorithms are precise, step-by-step instructions that begin with an input value and yield an output value in a finite number of steps. Algorithms need to give the same outcome every time they are followed. Instructions need to be able to be followed by anyone without any input from others – they should be precise and unambiguous.

analyse - *tātari*

To analyse in the technology learning area is to examine something methodically and in detail, in order to explain and interpret it. Analysis is an essential aspect of technological literacy as it supports students to develop specialist perspectives.
As a step in the design process, analysis involves evaluating ideas for feasibility, cost, and effectiveness. Consider which ideas are most realistic to implement within the timeframe, budget, and resources. Look at the pros and cons of each idea and how they will meet the needs of users. This occurs prior to further development - whanaketanga of some of these ideas.

annotate (annotation) - *kupu tāpiri*

Annotation is used to identify the features of conceptual designs and explain how the design works. Other words that can be used to describe annotation include labelling, explaining, notation, comments.

anthropometric data - *raraunga ine tinana*

Statistical measurements of the human body are types of anthropometric data. These play an important role in industrial design, clothing design, ergonomics, and architecture. Changes in lifestyles, nutrition, and ethnic composition of populations lead to changes in the distribution of body dimensions and require regular updating of anthropometric data collections.

array - *tūtohi tukutuku*

An array is a data structure that contains a group of elements (values or variables), typically all the same data type, for example, integers. Arrays are commonly used in computer programs to organise a related set of values so that it can be easily sorted or searched.

attribute - *āhuatanga*

Attributes are descriptive aspects of the physical and functional nature of a technological outcome. There are two types of attributes.

- Functional attribute: what an outcome, or part of an outcome, does.
  - For example, it provides grip, stores water, or joins surfaces.
- Physical attribute: a spatial or sensory aspect of a technological outcome.
  - Physical attributes describe how the outcome looks and feels. For example, hard, salty, spherical, loud, luminous, or big.

Attributes differ from specifications in that specifications define the physical and functional nature of the technological outcome in a measurable way.

- Key attributes are the most important attributes for a proposed outcome; the "must haves."

attributes and specifications - *āhuatanga me ngā tautuhinga*

Attributes are broad, general (physical and functional) features of an outcome.
They usually describe what an outcome is made from, its colour, its shape, what its purpose is, and how people use it. For example, the toy tractor is red, rounded in shape, made from wood, and is safe for children to use.
Specifications are defined and measurable (physical and functional) requirements of an outcome. They guide the development of an outcome by providing a unique set of design criteria. For example, an attribute may refer to the outcome being small enough to be comfortably held, whereas the specification would give the precise measurement in terms of length, width, and depth.
As students develop their understanding of design literacy, they are able to develop their own specifications from attributes (from level 5). When they evaluate the outcomes of others, students begin to identify and use specifications as a way to determine fitness for purpose from level 2 onwards.

authentic context - *he horopaki tūturu*

Authentic contexts are the real-world places where students learn about and apply their technological practice.
The issues and problems students are designing solutions for should be meaningful to them. Local context tests for developing an outcome are more inclusive for students as they get to see the ways that the outcome has improved on what was.
Some local contexts could be issues they've seen in the environment, social issues like the way sports teams operate, or physical issues with people interacting with designed outcomes like seating not accommodating everyone's needs.

B

black box - pūnaha whakapeke

A black box is a generic term used to describe hidden transformation systems.
For example, a door and its handle is a system designed so you can travel through a wall. The inputs are the materials (door, hinges, handle, and lock mechanism) and the forces used to turn the handle and push the door.
The system can be described as the following.

- When force is applied to the handle and the door is pushed, the door pivots on its hinges and opens.
- The output is that the door opens and closes.

In this example, the black box comprises the parts that cannot be easily seen (referred to as sub-systems). An example is the lever mechanism inside the door that transforms the input (force) into the output (door opens).
The concept of a black box is important in describing technological systems. Students begin to understand black boxes as one way that inputs are transformed into outputs.
Describing technological systems as black boxes has many advantages. For example, the reduced need to understand all aspects of the system or the ability to replace a faulty subsystem without disrupting the entire system. It also has disadvantages. For example, understanding of the entire system can be incomplete or troubleshooting can be difficult.

block-based programming - tuhiwaehere ā-paraka

Block-based programming is an interface for program building that allows users to drag and drop blocks representing programming commands. This alternative to text-based programming is a way of teaching students how to program using blocks of instructions with a focus on the logic of programming rather than details of syntax.

brainstorm - ohia manomano

Brainstorming enables students to think quickly and widely about a context and/or opportunity. It can be completed individually or in groups and stimulates ideas and thoughts. When brainstorming students may write lists, create mind maps or spider diagrams and/or have lots of open discussion.

brief - mahere

See design brief - mahere hoahoa.

brief development - whanake mahere

Brief development is an aspect of Technological practice. It is an authentic, iterative, and dynamic process. This is done by undertaking research, functional modelling, resource exploration, and consultation with stakeholders and end-users.
This final brief guides outcome development and acts as an evaluation tool against which the final outcome is assessed.
See also: design brief - mahere hoahoa.

C

Characteristics of technological outcomes - *Ngā āhuatanga o ngā otinga hangarau*

One of two components of essential learning in the nature of technology strand.
Students understand the characteristics of technological outcomes – why they are the way they are. They understand the relationship between people/societies, the environment, and technology. They can see how historical and cultural events influence the development of technology.
Students have opportunities to examine the fitness for purpose of technological outcomes – their proper and alternative purposes. They can make informed predictions about future technological directions at a societal, historical, cultural, and personal level.

Characteristics of technology - *Ngā āhuatanga o te hangarau*

One of two components of essential learning in the Nature of technology strand.
Students understand why technological outcomes are designed to enhance the capabilities of people and expand human possibilities. They learn how and why technology changes the made world in ways that have positive and/or negative impacts on the social and natural world.
Students have opportunities for informed debate about contentious issues. This increases their understanding of the complex moral and ethical aspects that surround technology and technological developments.

communicative model (visually) - anga whakawhitiwhiti-ā-ataata

A communicative model is a physical or virtual (digital) representation of a technological outcome. The purpose is to communicate the physical and/or functional attributes of a design concept. Communicative models do not test the design concept as fit for purpose.

competing priorities - whakaarotau tauwhāinga

Competing priorities are potentially conflicting outcomes within technological practice. They require identification and a judgement on relative value in order to decide on an appropriate course of action.
Competing priorities might include:

- conflicting stakeholder viewpoints
- practical practices versus ethically acceptable practices
- the use of renewable versus non-renewable resources
- budget constraints versus the use of ideal materials
- the use of resources of cultural significance in traditional versus contemporary contexts.

complex - *pīroiroi*

In senior technology programmes, the term "complex" is used to identify curriculum level 8 (NCEA Level 3) specialist knowledge and skills. Further explanation can be found in the explanatory notes of the subject specific standards. The progression is from "basic" (curriculum level 6) to "advanced" (curriculum level 7) through to "complex" (curriculum level 8).

complex systems - *ngā pūnaha pīroiroi*

Complex systems combine more than one system and/or include one or more subsystems.
Using a black box approach offers an opportunity for complex systems to be explored and understood in a holistic, rather than a detailed, sense. This allows system maintenance through replacement of isolated parts to be done, with little or no disruption to the rest of the system.
Technological systems is one of the eight components in the technology learning area. It is part of the technological strand.

component - *waehanga*

The three strands in the technology learning area are made up of components. There are eight components.
The components group together the learning outcomes and the achievement objectives to support the design and development of local curriculum.

- Technological practice – the know how strand has three components: brief development, planning for practice, and outcome development and evaluation.
- Technological knowledge – the know what strand has three components: technological modelling, technological products, and technological systems.
- Nature of technology – the know why strand has two components: characteristics of technology and characteristics of technological outcomes.

Computer Aided Design (CAD) - *Hoahoa ā-rorohiko*

The use of computer modelling software to design and create 2D & 3D images and models in a digital environment. See Computer numerical control for more information.

Computer Aided Manufacture (CAM) - *Whakanao ā-rorohiko*

The use of computer software and CNC machines to design and manufacture models, prototypes and final products. See Computer numerical control for more information.

computer model - *he tauira matihiko*

A computer-generated virtual realisation of an outcome, process, or system used for conceptual design and modelling to represent, communicate, and assess physical and functional attributes.

Computer Numerical Control (CNC) - *Te whakanao mā te whakatina ā-rorohiko*

The automation of machine tools that are operated by a computer. Computer aided design (CAD) drawings are output to programs that can generate a computer file that creates the commands needed to operate a particular machine. These commands are then loaded into the CNC machines for production. Any particular component might require the use of a number of different tools, such as drills or saws so machines often combine multiple tools into a single cell.
Alternatively, different machines are used with an external controller and human or robotic operators that move the component from machine to machine. The complex series of steps needed to produce any part is highly automated and produces a part that closely matches the original CAD design.

conceptual design - *hoahoa ariā*

A conceptual design is a description of a proposed technological outcome. It can be done using media such as scaled plans or drawings, scale models, computer simulations, written descriptions, or lists of components and assembly instructions.

conceptual statement - *tauākī mō te ariā*

The conceptual statement in a developed brief communicates the purpose of the technological practice to be undertaken. For example, what is to be done, who it is for, where it is to be used, when it is to be done, and why.

confidentiality agreement - *kirimana matatupu*

Confidentiality agreements are used to prevent others stealing ideas while the inventor considers how to develop them.
They allow someone to discuss their ideas with others, for example manufacturers. Discussions will not count against them should they eventually decide to apply for a patent.
Confidentiality agreements can be enforced in court.

connection technologies - *ngā hangarau tūhonohono*

Technologies used in network connections. They may be wired, optical, or wireless technologies.

constraint - *aukatinga*

Constraints are the external limitations or restrictions on technological practice. They include available resources, budget, classroom equipment, time, and codes of practice.

Construction and mechanical technologies - *Ngā hangarau hanganui me te pūhanga*

Construction and mechanical technologies is a specialist domain in NCEA senior secondary qualifications. This domain is supported in years 1 to 10 by the technological area, designing and developing materials outcomes. This domain focuses on the knowledge and skills associated with working with resistant materials and textiles materials to create technological outcomes.
It involves understanding and applying that understanding in materials and their properties, structures and machines, and modifying and creating patterns. Students develop basic, advanced, and complex understandings and skills related to constructing a quality, fit for purpose outcome.
The components of construction and mechanical technologies include the following.

- Construct a resistant materials product
- Construct a textiles product
- Knowledge of resistant materials
- Construction knowledge of textiles construction
- Knowledge of structures knowledge of machines
- Pattern making

context - *horopaki*

Context in the technology learning area applies in two ways.

1. It refers to the overall focus of a technological development (who will use it, what it could be, and where it will be used).
2. It describes where the learning experience takes place.

To ensure that the contexts chosen provide for a range of diverse learning opportunities, programmes should include contexts in both senses. For example, the context is outdoor seating within a home and family environment, with a focus on sustainability and transformation of materials.
These contexts should cover a range of transformations associated with technology. That is, the transformation of energy, information, and/or materials.
See also authentic context - he horopaki whaitake.

control mechanism - *pūrere whakahaere*

Control mechanisms within a technological system are designed to enhance the efficiency of the system by maximising the desired outputs and minimising the undesirable outputs. The system is designed to be self regulatory.

convergent design thinking - *whakaaro hoahoa rūnā*

Convergent design thinking is a process where designers focus on narrowing down ideas to find the best solution. After exploring many ideas, designers evaluate and refine them to choose the most effective and practical option. This approach helps turn creative ideas into clear, workable designs that meet user needs and solve problems.

copyright - *manatārua*

Copyright is the exclusive legal right to reproduce and control an original literary, musical, or artistic work.
Copyright protects original written works, computer programs, music, art and designs, photographs, videos, movies, and broadcasts. It protects them whatever format they are available in – including online.
Copyright comes into effect immediately – no need for registration.
The copyright owner can legally prevent others copying their work, issuing copies to the public, for example, by selling, making an adaptation of the work, such as writing a film script from a book, performing, playing, showing, or broadcasting the work in public.
Protection lasts for a certain term of years, depending on the kind of work and the country. In New Zealand, a written work is copyright for the lifetime of the author and another 50 years.
Once the term of copyright has expired, the work falls into the public domain for anyone to use.
For more information, see Copyright Licensing New Zealand.

create - *hanga, waihanga*

In the design thinking process, this step involves making the final design or product. This is when you bring the solution to life! Work with the best solution based on feedback, analysis, and prototypes. While this step results in the creation of the final product, the design process is not complete until after evaluate - arotake is complete. It may also be needed to revisit earlier steps, as the design process is iterative, not linear.

creative and critical thinking - *whakaaro auaha me te arohaehae*

Creative and critical thinking are important to technologists for:

- developing and exploring initial design concepts
- refining and selecting those that are feasible
- the way in which they realise these concepts in a material sense as technological outcomes.

This combination of informed creativity and critical reflection encourages technologists to:

- push boundaries
- learn from the past
- project into future possibilities.

critical evaluation - *arotake arohaehae*

Critical evaluation is the objective analysis and evaluation of an issue or an opportunity in order to form a judgement.

critical review points - *wā arotake arohaehae*

Critical review points are important periods of evaluation identified by students in planning for projects. These points provide an opportunity to make modifications to the brief and adjustments to the remaining critical review points themselves.

cutting list - rārangi whakanao

A parts and components list that is used in the planning for manufacture stage of the design process. It instructs on the materials, sizes, features and quantity of the product being produced and can support costing the final product.

D

deconstruct - wetewete

In the technology learning area, deconstruct means to interpret a text (or artwork) by discovering, recognising, and understanding the underlying (unspoken and implicit) assumptions, ideas, and frameworks.
Deconstruct is also to methodically and systematically remove component parts of an outcome to understand how the outcome is constructed.

define - tautuhi

In the context of design thinking, "defining" a problem occurs after the second step after "noticing" and "empathising." Use all the information from the previous steps to articulate the core problem you want to solve. This step helps focus on the most important issues to be address. It is the act of honing in on an outcome to be developed, by identifying a need or opportunity, the stakeholders, the necessary attributes, etc. Following this it is time to ideate - te whakaputa whakaaro.

derive - tohutoro

NCEA standards use "derive" to mean to extract or draw from an acknowledged source.

describe - whakaahua

Describing is one of the technology learning area's specialist literacies. When students describe, they give details from their viewpoint. This is an essential aspect of students developing perspectives.
NCEA standards use "describe" to mean to detail and/or characterise; to give an account by giving details of the characteristics.

design brief - mahere hoahoa

A description of a desired outcome that would meet a need or realise an opportunity.
A brief has two parts.

- A conceptual statement that guides thinking at the early stages of designing.
    - This initial brief includes the what, where, who, when, and why questions in response to the need or opportunity. Students develop a set of potential attributes and specifications, in collaboration with end-users and stakeholders.
- A developed brief results from the dynamic process (technological practice) of developing, testing, and trialling ideas.
    - This is done by undertaking ongoing research, functional modelling, resource exploration, and consultation with stakeholders and end-users.
    - This final brief guides outcome development and is crucial to a student's design process. It serves as an evaluation tool against which the final outcome, and the practice undertaken to develop it, is evaluated.

design elements - āhuatanga hoahoa

Design elements come from the key design aspects of aesthetics and function. For example, shape, form, finish, environment, point, line, plane, or pattern.
Design elements related to physical nature include: movement, pattern, rhythm, proportion, balance, harmony, contrast, style, texture, and colour.
Design elements related to functional nature include: strength and durability, safety, stability, efficiency, reliability, user-friendliness, ergonomic fit, texture, viscosity, consistency, structure, nutritional value, and taste.

design era - takiwā hoahoa

Throughout the ages there have been many different design eras and design styles come into fashion. Understanding design eras - what has gone before and the influences of design- can aid and support new creativity and innovation. Some examples of design eras/styles are Victorian age, Bauhaus, Arts & crafts movement, Art Deco, Art Nouveau and pop icons.

design ideas - whakaaro hoahoa

Design ideas are inspired by research, past practices, and life experiences that have the potential to contribute to a design (conceptual or otherwise) that meets the specification of the brief.

design judgements - whakataunga hoahoa

Design judgements are decisions made, or opinions expressed, that reflect a designer's perspectives, values, tastes, or views. These may be supported by qualitative and/or quantitative data through research.

design principles - mātāpono hoahoa

Alongside elements of design there are also principles of design to consider. Examples include pattern, contrast, emphasis, balance, proportion/scale, harmony/unity and rhythm/movement.

design thinking - anga whakaaro hoahoa

The creative and analytical thought processes that lead to new ideas and improvement that informs designing. There are a variety of ways to break this process into steps. TENZ uses an eight step model: notice; empathise - ngākau aroha; define - tautuhi; ideate - te whakaputa whakaaro; analyse - tātari; develop - whanaketanga; create; evaluate - arotake. The design process is iterative; go back and forth between steps as needed. For example, you might redefine the problem after you evaluate the design or iterate on your prototype after testing. The process repeats to create better solutions over time.

develop - whanaketanga

The stage of the design process that supports the testing and trialling of the conceptual designs through a variety of means. Development can include creating 2D and 3D models, material testing, getting stakeholder feedback, improving and modifying the final design(s). Here ideas more tangible; it's important to test out designs in small-scale ways and see how they work in reality. Following this, it is time to create

Digital technologies - Hangarau matihiko

Digital technologies is a specialist domain in NCEA senior secondary qualifications. This domain is supported in years 1 to 10 by the technological areas, computational thinking for digital technologies (CTDT) and designing and developing digital outcomes (DDDO) and their progress outcomes.At curriculum levels 6 and above, the progress outcomes set out the learning expected of students engaged 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 New Zealand Curriculum.

discipline - pekanga mātauranga

In technology a discipline is a specialised field of learning, for example, food technology, nanotechnology, computer science, or medicine.

discuss - matapaki

Discuss means to consider, compare, and contrast different evidence and opinions with others. Found in: upper primary onwards.

divergent design thinking - whakaaro hoahoa roha

Divergent design thinking is a creative process where designers explore many different ideas and possibilities without worrying about finding the perfect solution right away. It involves brainstorming, experimenting, and thinking outside the box to come up with new and interesting design concepts. This approach helps designers discover innovative solutions that meet user needs and improve the overall design.

drawing conventions - tikanga tā

Drawing conventions are the range of accepted practices (line types, projection methods, dimensions, and scale) associated with formal working drawings. Drawing conventions need to be appropriate to the drawing type and correctly applied. Drawing skills also draw on relevant standards and codes of practice.

E

empathise - ngākau aroha

To make things that people really like and find useful, we need to understand what they need and like. Empathising with the needs and circumstances of others is an early step in the design process, after noticing. This can be done via firstly via talking to people who will be affected by your design in order to understand their challenges, desires, and needs, and then thinking about how they feel and what they need to have a better experience. Following on from this, it is time to define the problem - tautuhi.

end-user - kaiwhakamahi mutunga

End-user refers to the intended user of a technological outcome. As students undertake their technological practice, they take into account immediate social and end-user considerations so that they can be sure they are designing ethically and creating socially acceptable outcomes.
See also: stakeholder.

engineering - mātai pūhanga

The branch of science and technology concerned with the design, building, and use of engines, machines, and structures. It applies mathematics and scientific principles to solve problems.

ensure - tāu i mahi ai [kia]...

In the New Zealand Curriculum, the word "ensure" is used when the teacher plays a monitoring role, to check that conditions critical for learning are present.
For example, in planning for practice and outcome development and evaluation, the teacher must ensure that an appropriate brief is available to guide student work.
As ākonga progress through the curriculum, teachers provide the following types of assistance:

- Provide
- Guide
- Support
- Ensure

environment - taiao

In technology, the environment is the surroundings of, and influences on, a particular item of interest.

electronic environments - ao tāhiko

Defined as functional combinations of hardware and embedded software in the real world – that is, circuits, prototypes, or products.

physical environment - ao ōkiko

In technology, the physical environment usually refers to the location of the specific practice or the place where a final outcome will be located.

social environment - ao pāpori

The context of a group or groups of people and their interaction with a technological outcome and/or its development. It is a subset of a socio-cultural environment.

socio-cultural environment - ao ahurea

In technology, it is the combination of the social and cultural (including historical) context a technological outcome is developed or used in.

socio-technological environment - ao hangarau

The context(s) created by the interaction of technological outcomes and non-technological entities and systems.
Socio-technological environments include such things as communication networks and hospital transport systems. Exploration of these environments shows how technological outcomes (products and systems) and non-technological entities and systems (people, natural environments, and political systems) interact together.

ergonomics - mātai arotau

Ergonomics is about designing for the people. Ergonomics is the process of designing or arranging workplaces, products and systems so that they fit the people who use them. See Human factors in design for more information.

evaluate - arotake

To evaluate is to systematically determine the quality, value and importance of something.
Evaluation is the final step of the design process, occurring after a solution has been created. This involves observing how well the design works for users, and gathering feedback and to see if the problem has been solved. An assessment of fitness for purpose should be made. If the design solution is not quite right, make adjustments and improve your design. Remember that the design process is iterative, and it may be necessary to return to previous steps.

explain - whakamārama

To justify, to state why. Being able to explain is an important aspect of technological literacy and is essential for students to develop specialist perspectives.
In NCEA standards, to "explain" requires students to describe in detail the what and the why, in order to clarify information.

explore - tūhura

In NCEA standards to "explore" requires students to undertake research and analyse the results.

F

feasible - ka whaihua

An idea is feasible if it is capable of being accomplished or brought about.

feedback - whakahoki (kōrero)

Stakeholder feedback is information received from a person or group with a legitimate interest in a given project. It can be at any point within the development process.

- Subjective feedback is based on the opinions or viewpoints of the person giving the feedback, and this will vary from person to person.
- Objective feedback is based on facts rather than opinions. It may be based on measurements used to collect information.

feedback loop - whakahokinga whakatina

A feedback loop is a mechanism, process, or signal that works within prescribed parameters to control a system.
See also: control mechanism.

field of technology - mātai hangarau

Fields of technology are the specialist areas in which design happens such as medical, sporting, communication, textiles, furniture, transport, food, or military.

fit for purpose - whaitake

Fitness for purpose is the ability of a technological outcome to do the job, where the job to be done is clearly defined by the brief. The technological outcome serves its intended purpose within its intended context.
Fitness for purpose in its broadest sense extends the context to the practices involved in the development of the outcome, including such things as:

- the sustainability of resources used
- treatment of the people involved in manufacture
- ethical nature of testing practices
- cultural appropriateness of trialling procedures
- determination of life cycle
- ultimate disposal.

flow diagram - *hoahoa rerenga, hoahoa ripo*

A flow diagram may refer to any of the following.
- Control flow diagram – a diagram to describe the control flow of a business process or program.
- Data flow diagram – a graphical representation of the flow of data through an information system.
- Process flow diagram (in operations) – a graphical representation of the operations involved in the process.

Food technology - *Hangarau kai*

Food technology is part of materials and processing (level 1), and processing technologies (level 2/3) in NCEA senior secondary qualifications. In years 1 to 10, this domain is covered by designing and developing processed outcomes (DDPO). In processing technologies students develop understanding and skill in the combining of ingredients to formulate a new product. In manufacturing students develop knowledge and practice in creating quality outcomes.

function (1) - *āheinga*

An item's function is the way that it works or the purpose for which it exists.

proper function - *āheinga matua*

The intended behaviour and/or use of a technological outcome. When a product or system does not behave as intended, it is said to malfunction.

alternative function - *āheinga tuarua*

Uses for a technological outcome, product, or system that were not intended by the developers.
This term is used at all levels across all technological areas.

function (2) - *taumahi*

A named section of a computer program that performs a specific task. Functions help make code more efficient and reusable. They may take input parameters and produce output.

functional attribute - *āhuatanga āheinga tuarua*

Features of an outcome, or part of an outcome, that affect what the outcome does.
For example, a cup handle has a physical attribute of looking rounded. The cup handle being curved is also a functional attribute as the shape makes it comfortable to hold, reducing the chance of liquid being spilled out.
See also: attribute - āhuatanga.

functional characteristics - *āhuatanga āheinga matua*

Functional characteristics are the core actions or roles an outcome performs—what it is designed to do. These are broader and more essential than functional attributes, focusing on the overall purpose and performance of the product or system.
For example, the functional characteristic of a cup is to hold and contain liquids safely for drinking, while the functional attributes (like the handle shape) support how well it performs this function.

functional modelling - *whakatauira i ngā āheinga*

Functional modelling is creating a representation of a technological solution that enables the ongoing evaluation of design concepts for a yet-to-be-realised technological outcome. It is a key activity within the technological modelling component. It can involve one or more mock-ups, models, or prototypes. Functional models are usually made in substitute materials such as card or paper.

functional qualities - *te whakaine i te painga o ngā āhuatanga āheinga*

Functional qualities are specific and measurable positive characteristics of a technological outcome.
For example, the functional qualities of a china cup are that it remains cool to the touch when using it to contain and drink hot liquid, due to the material it is made from and the design to fit the hand (ergonomics).

functional reasoning - *te wetewete i ngā āheinga*

Functional reasoning provides a basis for exploring the technical feasibility of a design concept and the realised outcome. It is the reasoning behind "how to make it happen" in the functional modelling phase. It is the reasoning behind "how it is happening" in prototyping.
For comparison see: practical reasoning - te wetewete i ngā whakataunga.

G

Gantt chart - *Kauwhata pou Gantt*

A Gantt chart is a type of bar chart that shows when tasks need to be undertaken within a project, and, perhaps, the resources required for them. It is named after the American engineer Henry Lawrence Gantt.

graphic organiser - *tātaitanga whakaahua*

A graphic organiser is a graphic template on which data is entered and is used to compare and contrast the identified data.

graphical user interface (GUI) - *tāhono kaiwhakamahi whakairoiro*

A graphical user interface (GUI) is a device or program enabling a user to interact with electronic devices via icons and visual indicators rather than through text commands. The icons and visual indicators are generally manipulated by a mouse or via touch screen technology.

graphics practise - *hoahoa whakawai*

Graphics practice involves expressing visual literacy through the development of a design idea by applying design and visual communication techniques and knowledge.

guide - *aratohu*

In the New Zealand Curriculum, the word “guide” is used when students have some level of understanding and competency, and the teacher takes responsibility for developing understanding further.
As ākonga progress through the curriculum, teachers provide the following types of assistance:

- Provide
- Guide
- Support
- Ensure

H

HACCP - *Te Mahere Arotake i ngā Wāhi Pūmate Matua*

The Hazard Analysis Critical Control Point (HACCP) plan identifies ways in which potential food safety hazards could be introduced. It specifies preventive measures to ensure that they are not. The comprehensive plan reviews potential risks associated with the ingredients, packaging, equipment, and staff, as well as all the stages of the production process. It covers everything that influences the work environment, equipment, processes, and people involved.

hedonic scale - *āwhata e whakaine i te āhuareka*

The hedonic scale is used in sensory testing where the tester evaluates a food product and marks it on a range from "like extremely" to "dislike extremely.”

heuristic- *he tikanga whakaoti rapanga*

A heuristic is a problem solving “shortcut”, for example a technique for solving a problem more quickly when classic methods are too slow. A heuristic could also be used for finding an approximate solution when classic methods cannot provide an exact solution. An example is a “greedy algorithm,” which makes a series of locally optimal choices in the hopes of approximating an overall optimal solution. The word “heuristic” can also be used to describe development rules such as “prioritise the most important tasks first.”

human factors in design - *ngā take tangata i ngā mahi hoahoa*

Human factors include ergonomic and aesthetic factors that influence the design of products, systems, and environments. These factors may include the use of anthropometric, psychological, and sensory data gathering and analysis techniques.
An understanding of spatial relationships between people, objects, and their environments is important when considering human factors in design.

I

ideate - *te whakaputa whakaaro*

The generation of lots of conceptual ideas - brainstorming tools and sketching/modelling can be used to quickly generate ideas. Ideate by brainstorming possible solutions to the defined problem.Be creative and think of many possible ideas—don’t limit yourself to one right away. Think of alternative solutions and explore different angles to tackle the issue. “Ideate” is a design thinking step occurring between “define” and analyse - tātari.

identify - *tautohu*

To identify is to indicate, spot, or recognise. It is an important aspect of technological literacy and is the first step students take as they develop a specialist perspective.
To be technologically literate is to be able to:

- identify (say what)
- describe (give details)
- explain (say why)
- justify (give reasons and evidence for a statement or judgement in an age appropriate way).

inquiry - *ako pakirehua*

Inquiry is a process of deciding on a focus and developing a question or questions, then undertaking research to gather information, followed by organising and analysing information. In Digital Technology, this is followed by proposing an outcome.

in situ - *taunga taketake*

In the original position or place.
In technology (and engineering), in situ can often mean in the field, on site, or where the outcome is going to be positioned and used.

Indicators of Progression - *Ngā Paetohu Kokenga*

The indicators of progression break down the achievement objectives into teacher guidance – how teachers can support students to achieve at that level.
They also develop each achievement objective into specific learning outcomes that can be selected from when designing curriculum.
Indicators of progression were developed in the technology learning area to help teachers design their local curriculum. The indicators are indicative of the level expected by the achievement objective. The indicators can be used to plan learning experiences, aid in diagnostic assessment, and support formative interactions within the classroom to help scaffold student learning. They can also support summative assessment for reporting purposes. They do not provide a checklist and should be viewed holistically.intellectual property right - *mana whakairo hinengaro*
Intellectual property (IP) is an original, creative product of the intellect that can be developed into something more tangible. For example, an idea or an innovation developed into an invention or a work of creative endeavour. As property it can be owned, rented, sold, or stolen.

intelligent system - *pūnaha mōhio*

Intelligent systems are designed to adapt to environmental inputs so that the nature of the system components and/or transformation processes change.

intermediate outcomes - *tauira o te otinga*

Intermediate outcomes occur as a result of technological practice. They include feasibility studies, conceptual designs, models, or prototypes.
Intermediate outcomes – important in technology and technology education – are valuable for developing ideas, exploring, testing, and communicating aspects of technological outcomes before they are fully realised in situ.

intervention by design - *mā te hoahoa ka whakaea*

Intervention by design is the intent of the technology learning area.
When intervening, students use and develop perspectives in specialist areas. They apply knowledge and skills, with their developing beliefs and values (moral, ethical, cultural, and social). They do this as they design and create technological outcomes in authentic contexts, which address needs or opportunities while taking account of end-users.
Technology (understood as inseparable from society and the environment) allows space for ways of looking at the world differently and space to produce innovative solutions and create technologies.

issue - *take*

An issue in technology refers to a specific aspect within a particular context that will enable students to identify a need or opportunity.

iteration - *tukurua*

An approach or technique used to create, refine, and improve a project, initiative, product, art work, or design. The weaknesses and how to improve them are repeatedly worked on and thought through. Once a prototype has been tested, it may be necessary to iterate back through all or part of the design process again, potentially many times.

J

justify - *parahau*

In technology, to justify is to show by reasons, argument, and evidence, why something is correct.
To be technologically literate is to be able to:

- identify (say what)
- describe (give details)
- explain (say why)
- justify (give reasons and evidence for a statement or judgement).
  - Students should provide justifications in their technology learning from NZC level 4.

In NCEA, "justify" means to provide an explanation with acceptable reasons or evidence.

K

key stages - *kōeke matua*

Key stages are the important steps required to develop a technological outcome. These key stages can occur sequentially or in parallel and are often documented in a flow chart. They may be reviewed and changed as the project proceeds.
Key stages are an integral part of technological practice. Critical review points can be added as another check, particularly in senior secondary.
See also: critical review points - wā arotake arohaehae.

L

legal responsibilities - *haepapa ā-ture*

Legal responsibilities are requirements established by law. The necessity for legal compliance can influence the nature of the practice and the development of a brief.
Legal responsibilities are set out in the following.

- Acts
  - For example, Fair Trading Act 1986, Consumer Guarantees Act 1993, Health and Safety at Work Act 2015, Privacy Act 2020, Employment Relations Act 2000, Resource Management Act 1991, and Hazardous Substances and New Organisms Act 1996.
- Standards
  - For example, ISO standards – 9000, 14000 series, and Standards New Zealand Paerewa Aotearoa standards.

local curriculum - *marautanga haukāinga*

Your local curriculum is the way that you bring The New Zealand Curriculum to life at your school.
It should:

- be responsive to the needs, identity, language, culture, interests, strengths, and aspirations of your learners and their families
- have a clear focus on what supports the progress of all learners
- integrate Te Tiriti o Waitangi into classroom learning
- help learners engage with the knowledge, values, and competencies so they can go on and be confident and connected lifelong learners.

loop - *koromeke*

A loop is a sequence of instructions in a program that is repeated until a certain condition is reached.

M

Makerspace - *Wāhi Waihanga*

A place in which people with shared interests, especially in computing or technology, can gather to work on projects while sharing ideas, equipment, and knowledge. Makerspaces foster innovation through hands-on experimentation.

malfunction - *[kei te] hapa*

A technological outcome that does not carry out its proper function successfully is described as a malfunction or is said to malfunction.
The concept of malfunction and failure appears in Characteristics of technology and Characteristics of technological outcomes from level 5.

manufacturing processes - *tukanga whakanao*

Manufacturing processes are the series of steps used to turn raw materials or parts into finished goods..
Examples include:

- milk powder manufacture
- beer brewing
- meat packing and freezing
- carpet manufacture
- urea production from natural gas
- newsprint production
- oil refining
- injection-moulded plastics
- electronics manufacturing
- fish filleting and freezing
- rotational moulding plastics
- superphosphate production
- agricultural machinery manufacturing
- possum and merino yarn manufacturing
- creation of marine / leisure products
- niche furniture making
- garment manufacture.

marking out - *whakawhitinga o tētahi hoahoa*

Transferring a design or pattern to a workpiece with appropriate tools and techniques.

material evaluation - *te arotake i ngā rawa*

Material evaluation is about assessing materials. It can include a material's composition and structure, how a material's properties can be changed, the material's expected performance specifications, and the social, cultural, and environmental factors associated with where the product is to be situated.

measurement - subjective & objective - *inenga - taparoto me te tapatahi*

Types of measurement used to test and trial attributes and specifications of technological outcomes:

- **Subjective measurement** is dependent on the views of the users and is qualitative.
- **Objective measurement** uses a scientific approach to checking attributes rather than personal opinion and is quantitative.

mental model - *whakaahua ā-hinengaro*

A mental model is an explanation of someone's thought process about how something works in the real world. Cognitive scientists have studied mental models in order to understand how humans know, perceive, make decisions, and construct behaviour in a variety of environments.

mind map - *mahere huatau*

A mind map is a diagram used to represent words, ideas, tasks, or other items. These are linked to and arranged radially around a central key word or idea.

mitigate risk - *whakamaurutanga o ngā tūraru*

To mitigate risks involves taking steps to reduce the incidence and/or the effects of failure.

mockup - *tauira iti (he wāhanga o tētahi otinga)*

A mockup is a physical representation of an idea (part of an intended solution) that is used to test or predict its feasibility.

model - *tauira*

A model is a physical representation of a technological solution (sometimes scaled) that enables a solution's feasibility to be tested or predicted.
For key ideas and more information see technological modelling - te whakaputa i ngā tauira hangarau.

modes of production - *ngā momo tukanga whakanao*

Mode of production refers to production processes that include batch, continuous, and semi-continuous.

modify - *whakakē*

To make minor adjustments or improvements.

mood board - *papa piropiro*

A tool used by designers to explore a context and inspire ideas. It is a visual board that has a collection of images and materials linked to the overall context. It can include images linked to colour, design, themes, people, users, materials, etc. Mood boards come in a variety of sizes - in fashion design, for example, a whole wall of a design office may be set up as a mood board to inspire the designers.

N

Nature of technology - *Ngā āhuatanga o te hangarau*

Nature of technology is one of the three essential technology learning area strands.
It has two components; Characteristics of technology and Characteristics of technological outcomes.
In the Nature of technology strand, the emphasis is on knowing why. Students come to understand why technology is an intervening force in the world and learn that technologies are inevitably influenced by (and influence) history, society, and culture.

need - *matea*

In technology a need is an identified requirement of a person, group, or environment. A need is identified from an issue and sits within a context. Technological practice can be undertaken in an attempt to meet an identified need.
Needs differ from opportunities, as opportunity in technology is an identified possibility rather than a requirement.

notice - *aro*

Noticing is the first step of design thinking. This involves paying attention to the world around, and identifying areas that need improvement. This step is followed by empathising - ngākau aroha.

O

operational parameters - *tawhā taumahi*

Operational parameters are the boundaries and/or conditions a system is designed to function within.

opportunity - *wātea*

An opportunity in technology is an identified possibility for a person, group, or environment.
For example, an opportunity where an existing technology can be used to solve a problem. An opportunity is identified from an issue and sits within a context. Technological practice can be undertaken in an attempt to realise an identified opportunity.
Opportunities differ from needs, as a need in technology is an identified requirement rather than a possibility.

optimise - *whakamarohi (computing)*

To optimise something means to make it as effective and functional as possible.

outcome - *otinga*

See: technological outcome - otinga hangarau.

Outcome development and evaluation - *te whakawhanake me te arotake i ngā otinga hangarau*

Outcome development and evaluation is one of the three components of essential learning in the technological practice strand.
This component focuses on practices that take development through to production and final testing. These practices involve generating and testing ideas, refining concepts, and selecting, producing, and evaluating outcomes.

P

parity bit - *moka pūrite*

A bit added to a string of binary code to detect errors. A parity bit (also known as a check bit) gives data either an odd or even parity, which is used to validate the integrity of the data.

patent - *mana waihanga*

A patent is a right granted to protect an invention. Owning a New Zealand patent means having the legal right to prevent others in New Zealand commercialising an invention – although this could necessitate taking them to court,
The main kinds of inventions that can be patented are:

- useful products that are new or improved
- new or improved processes that can be used in industry
- new computer technologies.

performance properties - *āhuatanga tutukinga*

All materials have inherent qualities that combine to provide the material with performance properties. The properties of a material determines how it is used and behaves in certain environments and under certain processes.
For example, butter melts at moderate temperatures but timber does not. While butter can easily be cut with a blunt knife, a saw and more effort is required to cut timber. Thus, you can make a chair out of timber, but you could not make a chair out of butter.
Performance properties include:

- warmth
- strength
- taste
- flexibility
- crease resistance
- malleability
- drape
- form
- durability
- absorbency
- colour
- texture
- appearance
- sheen
- style.

Performance properties can be altered through working the materials so that it can improve the function of a technological product. For example, materials can be shaped, joined, combined, heated, or finished.

ping - *iatare*

A ping is a network software utility used to test if a computer is operating and its network connections are intact.

plan of action - *mahere mahi*

A plan of action is a planning tool that outlines intended actions to accomplish a specific goal. It sets out how resources such as time, expertise, materials, and finance will be used in a coherent and systematic manner during the development of a technological solution.
In addition, a plan of action establishes key stages and notes intermediate outcomes that will act as milestones. It states how each of the resources is to be used to achieve the outcome at each intermediate outcome.

Planning for practice - *whakamahere mō te whakaharatau*

Planning for practice is one of the three components of essential learning in the Technological practice strand. This component supports students to do both the up-front and on-going thinking as they design and develop outcomes. Effective planning enables technologists to systematically account for all the factors that influence the successful fulfilment of a brief. It also supports reflection and decision making.

planning tools - *ngā taputapu whakamahere*

Planning tools help guide action steps to an outcome. For example, brainstorms, mind-maps, idea banks, reflective journals and scrapbooks, plans of action, Gantt charts, flow diagrams, graphic organisers, spreadsheets, and databases.

practical reasoning - *te wetewete i ngā whakataunga*

Practical reasoning focuses on knowing what is justifiable when deciding if something can be done and if it should be done. This is done by applying social and cultural morals and ethics in a practical context.
For comparison, see: functional reasoning - te wetewete i ngā āheinga.

problem decomposition - *wāwahinga wero*

Problem decomposition is breaking down an issue or problem into smaller ones, often so it can be solved more easily.

proposal - *whakatakoto*

A proposal is a suggested outcome to be developed, which comes about as a response to an inquiry that has been conducted. The proposal will detail an outcome to be made and how it is informed by the findings of the inquiry.

prototype - *tauira whakamātau*

Prototyping is the modelling of a realised but yet-to-be-implemented technological outcome. The purpose of prototyping is to evaluate the fitness for purpose of a technological outcome against the brief. In the design thinking model, a prototype is made from one (or more) of the ideas generated via ideation, and will go on to be tested.
A prototype is used to establish a defensible case for:

- implementation
- disposal
- refinement
- or further development

of a technological outcome.
See also: technological modelling - te whakaputa i ngā tauira hangarau.

provide - *homai/hoatu*

In the New Zealand Curriculum, the word "provide" is used when the teacher takes full responsibility for introducing and explicitly teaching new knowledge, skills or practices.
As ākonga progress through the curriculum, teachers provide the following levels of assistance:

- Provide
- Guide
- Support
- Ensure

pseudocode - *waehere-kikoika*

In programming, pseudocode is a detailed but readable description of what a computer program or algorithm must do. It uses the structural conventions of a normal programming language, but is intended to be read by humans rather than machines.

Q

quality check - *hihira i te kounga*

Checking an outcome to see that it meets the specifications. In a wood technology class, this could involve checking that a wooden storage box has correct measurements, secure joints, a smooth finish, and functions properly (e.g., the lid opens smoothly). This ensures the product is safe, durable, and fit for purpose.

query - *uiui*

A query is a search in a database to retrieve data that matches certain parameters.

R

rapid prototyping - *te whakaputa tere i ngā tauira whakamātau*

- **Physical rapid prototyping** is using a range of techniques to quickly fabricate a physical model from a computer-aided design (CAD) digital file.
- **Rapid prototyping as a method within a design process** is iterative and sometimes lightning fast. The process includes research and investigation, conceptualisation, prototyping, and testing. It helps designers and technologists quickly discover, test, and validate their best ideas.

reasoned decision-making - *te āta whakatau i ngā whakataunga*

Reasoned decision-making underpins technology. This reasoning relies on both functional and practical reasoning.

- **Functional reasoning** focuses on knowing how and why things work.
- **Practical reasoning** focuses on knowing what is justifiable in social and ethical terms. It is based on what should or ought to be done.

recipe - *tohutao*

A set of instructions that a chef or cook follows to make a food technology outcome. It can be used as part of the planning process.

redundancy - *tāweretanga*

In technological systems, redundancy means providing more time, information, and/or resources than is strictly necessary for a system's successful functioning. It is allowing "a bit extra" and/or the duplication of component parts of a system and/or a subsystem as a backup or fail safe provision to increase reliability.

reflective journal - *hautaka huritao*

A reflective journal is a record of progress, which may be used as a planning tool or for self or external assessment. Journals, blogs, and folios are good examples of assessment for learning because they are progressive in nature, inquiry based, ongoing, from a personal perspective, and iterative.

registered designs - *ngā hoahoa kua rēhitangia*

The external appearance of some products can be protected by applying to register a design right at the Intellectual Property Office of New Zealand (IPONZ).
A design right protects a new or original shape, pattern, or decorative finish that has been applied to the product by an industrial process.

reliability - *pono*

In technological systems, reliability is a system's ability to perform consistently and maintain its expected functions when operated within a specified manner.

remote data packet exchange - *whakawhitinga mamao o ngā pākete raraunga*

Remote data packet exchange is the process of a device sending or receiving data packets to or from a location outside the home network. This can involve using a protocol such as TCP (Transmission Control Protocol) or UDP (User Datagram Protocol) and resolving the DNS (Domain Name System).

research - *rangahau*

The seeking, collecting, study and analysis of information and data pertaining to a particular topic, with the aim of generating new knowledge and understandings.

resistant materials - *rawa kaha papare*

Resistant materials are broadly categorised as materials that cannot be readily crushed, cut, distorted, or scraped. Examples include wood, metal, ceramics, plastics, glass, and their composites.
Technological areas (contexts students learn in) were introduced with the revision in 2017. Previously, resistant materials and textiles were grouped for senior secondary under the title, construction and mechanical technologies (CMT). They are now located together in the revision within the technological area designing and developing materials outcomes (DDMO).

resources - *rauemi*

Resources include raw materials, time, personnel, and information and are used to help achieve a goal or an objective.

- Consumable resources are materials that will be used up during their use.
- Tools and equipment are required items that will not be used up.

risk - *tūraru*

In technology education, risk refers to the possibility that an action, event, or lack of action could negatively affect objectives, or the success, safety, or quality of a project. Identified risk is measured in terms of consequences and likelihood. Managing risk involves identifying potential problems, assessing how likely they are to occur, and understanding their possible impact.

rongoā Māori

Rongoā (medicine, drug, remedy) Māori refers to traditional Māori medicines produced from New Zealand native plants.

rubric - *mahere paearu kounga*

A rubric is an assessment tool that conveys a list of criteria important to the assessment task. It includes levels of quality for each criterion.
For a rubric to be most effective it should:

- use specific language – avoiding terms such as "sometimes" or "rarely;"
- contain requirements that are both measurable and observable;
- be written in positive language that all students can understand;
- be realistic, providing a valid entry point for all students.

S

safety plan - *ngā whakaritenga haumaru*

A safety plan identifies hazards and strategies to deal with them, developed within technological practice. This plan may refer to physical, cultural, and ethical issues and the 'fitness for purpose' of an intended outcome.

scheduling - *tuhi hōtaka*

Scheduling is the planning of actions and events to a timescale. This could be done as a list, flow diagram, or other graphic organiser. Scheduling includes such things as planning construction orders or a production sequence.

school curriculum - *marau-ā-kura*

See local curriculum - marautanga haukāinga.

source code - *waehere pūtake*

Source code is the code of a computer program written so that its readable by a person, using the particular syntax of a programming language. For example, C, Python, or Java. Source code is compiled or interpreted into machine code able to be run by a computer.

spatial design - *hoahoa mokowā*

Spatial design is a design discipline that combines traditional design specialisms (such as architecture, landscape architecture, landscape design, interior design) with human factors, ergonomics and "people considerations." The emphasis of this discipline is on understanding the relationship between people and space, particularly looking at the notion of place.

special features - *āhuatanga motuhake*

Special features are advanced design and construction elements that enhance the function, structure, or appearance of a product. These features require a high level of technical skill and precision to successfully incorporate into a finished outcome. For example, in textiles it might mean a fly front or pin tucking, while in resistant materials it might mean a mortise and tenon joint, or turned table legs.

specification - *tautuhinga*

Specifications define the requirements of the physical and functional nature of an outcome in a way that is measurable. Specifications are used in a brief to define the nature of the appearance and performance requirements. It is these requirements against which an outcome can be evaluated as fit for purpose by key and wider stakeholders. The specifications may also include constraints on both the outcome and the practice that can be undertaken to develop it.
By contrast, attributes are not required to be measurable. For example, an attribute may refer to the outcome being small enough to be comfortably held, whereas the specification would give the precise measurement in terms of length, width and depth.

sprite - *hākoritanga*

A sprite is a character or visual representation of an object in a computer game, simulation, or application.

stakeholder - *hunga whaipānga*

Stakeholders are individuals or groups of people (whānau, families, communities, iwi, organisations, and businesses) with a vested interest in a technological outcome, and/or its development.

Key stakeholders (primary) - *hunga whaipānga matua*

Those people who are directly influential or will be directly impacted on by the technological practice itself and/or its resulting outcomes. This impact can include the technological outcome and any other by-products. A key stakeholder is the intended end-user of the outcome.

Wider community stakeholders (secondary) - *hunga whaipānga tuarua*

Those people who are less directly influential on or impacted by the practice or outcome. They have some level of influence, often through others. They may be affected by the project or its outcome in the future.

See also: end-user - kaiwhakamahi mutunga.

STEM (Science, Technology, Engineering and Mathematics) - PŪRAU (Pūtaiao, Hangarau, Pūhanga me te Pāngarau)

Science, technology, engineering, and mathematics (STEM) is an umbrella term used to group together the distinct but related technical disciplines of science, technology, engineering, and mathematics.

strand - *whenu*

The three strands are the starting point for all teaching and learning in the technology learning area.
They are:

- technological practice
- technological knowledge
- nature of technology.

Although the three strands are described separately, in reality they are almost always integrated in effective learning programmes.
While none of the strands are optional, sometimes particular strands may be emphasised at different times or in different years. Schools should have a clear rationale for doing this and should ensure that all three strands receive due emphasis over the longer term, assessing students' progress and achievement in relation to the strands.

subjective techniques - *rautaki taparoto*

Subjective techniques are evaluation methods based on personal opinion and judgements. Examples are sensory tests and opinion or preference surveys.

support - *tautoko*

In the New Zealand Curriculum, the word "support" is used when the teacher plays a supportive role through questioning and challenging students. The balance shifts towards the student taking more responsibility for their learning. The students draw from their past learning to consolidate and extend their understanding. As ākonga progress through the curriculum, teachers provide the following levels of assistance:

- Provide
- Guide
- Support
- Ensure

sustainability - *toitūtanga*

Sustainability is using resources, creating products, and/or providing services to meet present needs without compromising the ability of future generations to meet their needs by the same or similar means.

T

Technological knowledge - *mātauranga hangarau*

Technological knowledge is one of the three essential technology learning area strands. Technological knowledge is the specialist knowledge that students need in their kete in order to design and develop outcomes that are fit for purpose in the broadest sense. This includes Technological modelling, Technological products, and Technological systems.

technological literacy - *mātau hangarau*

"Technological literacy" was in the aim of the technology learning area prior to 2017. The revised technology learning area 2017 then states that:

- "The aim is for students to develop broad technological knowledge, practices, and dispositions."

To develop these, ākonga must be able to effectively communicate in a technological way.
To be technologically literate is to be able to:

- identify - tautohu – say what
- describe - whakaahua – give details
- explain - whakamārama – say why
- justify - parahau – give reasons and evidence for a statement or judgement.

This disciplinary literacy steps up through the curriculum levels. Students should be using identify and describe terms from level 1, explain terms from level 3, and justify terms from level 4.

technological modelling - *te whakaputa i ngā tauira hangarau*

Technological modelling is one of the three components in the technological knowledge strand.
Technological modelling is the testing of design ideas to see if they can contribute to a technological outcome being fit for purpose.
There are two types of technological modelling:

- functional modelling - whakatauira i ngā āheinga is the ongoing testing of design concepts
- prototyping - tauira whakamātau is the realisation of a fully functioning model.

Taken together, the two types of modelling provide evidence of factors that may impact on the development of a technological outcome and consequences that may result from it.
Technological modelling involves two kinds of reasoning:

- functional reasoning - te wetewete i ngā āheinga – how to make it happen, and how it is happening
- practical reasoning - te wetewete i ngā whakataunga – should we make it happen and should it be happening?

technological outcome - *otinga hangarau*

A technological outcome is a fully realised product and/or system created by people for a particular purpose.
Once it has been placed in situ, no further design input is required for it to function.
"Fully realised" means the outcome has moved beyond concept, plan, or model, and now exists and functions as designed in the made world. It is fit for purpose in every respect including aesthetic (looks).
This definition enables technological outcomes to be distinguished from natural objects such as trees and rocks and from other outcomes of human activity such as art works, language, knowledge, social structures, and organisational systems.
All technological outcomes have a dual nature: physical and functional.

- An outcome's physical nature is what it is made of and looks like.
- Its functional nature is what it can do.

Understanding the relationship between the two is a good starting point for understanding a technological outcome as a whole, and it is crucial when developing a product or system for a specific purpose.
Technological outcomes can be categorised as products and systems; however, distinguishing between the two is not always straightforward. It depends on how you look at the outcome concerned.
For example, you could describe a cell phone as a technological system, comprising interconnected components that work together to achieve a purpose. But you could also describe the same phone as a technological product, focusing on the materials used in its manufacture and not on the many interconnected components inside it.

technological practice - *whakaharatau hangarau*

Technological practice is one of the three essential technology learning area strands.
Technological practice encompasses the step-by-step actions involved in creating a technological outcome from first thoughts, right through to a final outcome/solution.
Technological practice includes identifying needs or opportunities, exploring, defining, and developing potential outcomes, modelling, evaluating, and testing to ensure resulting outcomes are fit for purpose. The stand is made up of Planning for practice, Brief development, and Outcome development and evaluation.

technological products - *hua hangarau*

Technological products is one of the three components in the technological knowledge strand. This component focuses on understanding material properties, uses, and development to understand how and why products work the way they do. Ākonga learn about [performance properties - āhuatanga tutukinga](#) and how materials can be formed, manipulated, and transformed to enhance the fitness for purpose of a technological product.

- **forming materials** involves bringing two or more materials together to create a new material that has a different chemical composition and structure. This changes its performance properties.
- **manipulating materials** involves working with existing materials in ways that do not change their properties as their composition and structure is not altered.
- **transforming materials** involves changing the physical structure of a material without changing its chemical composition. This changes some of its performance properties.

technological solution - *otinga hangarau*

A technological solution is proposed to meet the requirements of a brief. It will be presented in a sufficiently detailed and clear manner that it is both fully realisable (can be made and used), and can be fully tested against the specifications in the brief.

technological systems (1) - *pūnaha hangarau*

A technological system is a set of interconnected components that has been designed to fulfil a particular function without further human design input. These may transform, store, transport, or control materials, energy, and/or information. For example, a toaster is a technological system.

technological systems (2) - *pūnaha hangarau*

Technological systems is one of the three components in the technological knowledge strand.
Ākonga develop an understanding of the parts of systems and how these work together, understanding how and why systems operate in the way they do.

technology education - *akoranga hangarau*

Kaua e rangiruatia te hāpai o te hoe; e kore tō tātou waka e ū ki uta.
Don't paddle out of unison or our canoe will never reach the shore.
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, characterised by innovation and adaptation, 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.

testing & trialling - *whakamātau*

Testing and trialling is an important part of the design process. It enables the designer to check that their ideas and prototypes function correctly and safely, ensuring they meet the defined brief. Alongside stakeholder feedback, testing and trialling helps to modify and improve design ideas. In the design thinking model, functional models and prototypes must be tested, before potential iteration through earlier phases of design.

text-based programming - *waehere ā-kuputuhi*

Text-based programming is a traditional programming method in which letters, numbers, and symbols are typed to determine inputs and outputs. Text-based programming languages such as Python, C, and Java require programmers to follow a formal, text-based syntax.
Contrast with [block-based programming - tuhiwaehere ā-paraka](#).

tinkering - *tutū / raweke*

Tinkering is using a play-based approach to test and experiment. Students can try things out and experiment through hands-on activity, for example taking products apart to see how they work, or playing with materials to learn about their characteristics and properties.

trade secret - *whakapeke tauhokohoko*

Once an idea is developed into a commercial product the inventor can choose to continue to keep the way it is made a trade secret.
Any employees who need to know the trade secret would have to sign a confidentiality agreement in their employment contracts.

trademark - *mokopahiki*

A Trademark is a brand or logo distinguishing the goods or services of one trader from another can be registered as a trademark at the Intellectual Property Office of New Zealand (IPONZ). A registered trademark is entitled to display the ® symbol. A fee is paid to IPONZ when applying to register a trademark. It can be filed in Māori or English.
The main requirements for registration are that the trademark is:

- described graphically, that is, in words or pictures
- distinctive (unusual) and not something that is descriptive of the goods or services, because that would prevent other traders using that word
- not misleading or deceptive
- not offensive to any section of the New Zealand community.

All trademark applications are assessed to determine if they contain a Māori sign, a derived Māori sign, or Māori imagery. A Māori Trade Marks Advisory Committee may provide expert advice on trademarks containing Māori text or imagery.

transformation processes - *tukanga panoni*

Transformation processes occur within a system to ensure the inputs are changed into the outputs in a controlled and intended way, without need for additional human design input.
Transforming is changing the structure or particle alignment within an existing material (without changing its chemical composition) in order to change some of its properties.
Examples of the transformation process are felting, beating an egg white, heat-treating metals to harden or anneal them, steaming timber to soften its fibres so that it can be bent.

U

usability - *ratarata-kaiwhakamahi*

Usability is the ease with which people can employ a particular tool or other human-made object in order to achieve a particular goal.
In computer science and human-computer interaction, usability is the elegance and clarity of the design of a computer program's or of a website's user interface.
The concept of usability also includes learnability, retainability, and user satisfaction.

usability testing - *te whakamātau i te whakamahinga*

Usability testing, an effective way to verify an existing design or system, is a structured observation of users in a laboratory setting.
Users are observed performing important tasks with a working system or prototype. They are asked to think aloud while completing the tasks. This includes describing what they are trying to do, the hypotheses they are forming, and their expected results of an action.
The evaluator observes the user's performance noting problems, comments, and complicated paths. Usability tests are also useful for collecting quantitative data regarding time per task and number of errors.

user-centred design - *te hoahoa mō te kaiwhakamahi mutunga*

In user-centred design, products are designed with their intended users or end-users in mind at all times. In user-driven or participatory design, some of the users become actual or informal members of the design team.

V

variables - *taurangi*

In programming, variables are containers used to label and store data in memory. The data can then be used throughout a program.

- Integer variables use only numbers and so can be used for calculations.
- String variables are sequences of code that may contain numbers, letters, and other characters, and so cannot be used for calculations.