# Characteristics of Technology

Technology is defined as “purposeful intervention by design”, and technological practice as the activity through which technological outcomes are created and have impact in the world.

Technological outcomes are designed to enhance the capabilities of people and expand human possibilities. They change the made world in ways that have positive and/or negative impacts on the social and natural world.

Technology uses and produces technological knowledge. Technological communities endorse technological knowledge as valid when it is shown to support the successful development of technological outcomes.

All technology exists within a historical context, influenced by and influencing society and culture.

Technological practice is becoming increasingly interdisciplinary, relying more than ever on collaboration between the technology community and people from other disciplines.

## Indicators of progression

Level 1

**Achievement objective**

Students will:

Understand that technology is purposeful intervention through design

**Teacher guidance**

To support students to develop understanding of characteristics of technology at level 1, teachers could:

* provide opportunities for students to discuss what is meant by the made, natural, and social world and guide them to identify technological outcomes as making up a significant part of the made world
* provide students with examples of technologists and guide them to identify the sort of things they do as part of their technological practice. Technological practice involves the defining practices underpinning the development of a brief, the organising practices underpinning planning, and the production and evaluation practices involved in the development of an outcome that is fit for purpose as defined by the brief
* guide students to identify that the aim of technology is to design and make outcomes for an identified purpose.

**Indicators**

Students can:

* identify that technology helps to create the made world
* identify that technology involves people designing and making technological outcomes for an identified purpose
* identify that technological practice involves knowing what you are making and why, planning what to do and what resources are needed, and making and evaluating an outcome.

Level 2

**Achievement objective**

Students will:

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

**Teacher guidance**

To support students to develop understanding of characteristics of technology at level 2, teachers could:

* provide opportunities for students to discuss the made, natural, and social world and guide them to explore how technology relates to each of these
* provide students with examples of different technologist’s practice and guide them to identify any social and/or environmental issues that might have influenced their practice and the nature of the outcomes they produce. For example: social attitudes to the environment has resulted in some technologists choosing to only use renewable materials, cold and windy environmental considerations requiring clothing outcomes that have insulating and close- fitting attributes
* provide students with examples of technological outcomes and guide them to explore how these have changed over time and identify any changes that have resulted in terms of people’s capability to do things. Examples should allow students to recognize that increasing capability to do things may result in both positive and negative impacts on the person, society and/or the environment
* provide students with the opportunity to explore a range of technologies and guide them to identify examples of positive and negative impacts on people, society and/or the environment.

**Indicators**

Students can:

* describe the relationship between technology and the made, natural and social world
* identify social and/or environmental issues that may have influenced particular technological practices and/or the attributes of outcomes produced
* describe how particular technological outcomes have changed over time and identify if this resulted in changing how people do things
* describe examples to illustrate when technology has had a positive impact on society and/or the environment
* describe examples to illustrate when technology has had a negative impact on society and/or the environment.

Level 3

**Achievement objective**

Students will:

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.

**Teacher guidance**

To support students to develop understanding of characteristics of technology at level 3, teachers could:

* provide students with examples of different technologist’s practice and guide them to identify how social and environmental issues could have influenced their decision making about; what should be made and why, how planning should be done and what resources should be used, how materials could be manipulated and tested, how outcomes should be evaluated, and manufacturing considerations
* provide students with the opportunity to explore a range of technologies and guide them to determine why they have changed over time. Reasons for changes include such things as changing needs, fashions, attitudes, ethical and environmental stances etc., or the development of new materials, skills and knowledge
* guide students to determine the impacts different technologies have had on society and/or the environment over time
* provide students with opportunities to discuss technological knowledge as knowledge that technologists agree is important for the development of a successful outcome and that if this knowledge is useful for a number of situations it can be codified for quick reference. For example; material tolerances, ratios, dosage.

**Indicators**

Students can:

* describe how societal and/or environmental issues can influence what people decided to make, how they would undertake planning, the selection of resources, and how they would make and test an outcome
* explain why particular technological outcomes have changed over time
* describe examples of how technology has impacted on the social world over time
* describe examples of how technology has impacted on the natural world over time
* identify that technological knowledge is knowledge that technologists agree is useful in ensuring a successful outcome.

Level 4

**Achievement objective**

Students will:

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

**Teacher guidance**

To support students to develop understanding of characteristics of technology at level 4, teachers could:

* provide students with opportunities to examine a range of technologies that have and/or could expand human possibilities by changing people’s sensory perception and/or physical abilities. Examination of technologies should allow students to gain insight into how decisions are based on both what could and what should happen
* guide students to understand that ‘expanding human possibilities’ can result in positive and negative impacts on societies and natural environments and may be experienced differently by particular groups of people
* provide students with opportunities to examine and debate examples of innovative technologies that resulted in new possibilities. Examples should draw from the past and present and allow students to identify the creative and critical thinking that underpinned the developments.
* provide students opportunity to explore the wide range of knowledge and skills from diverse disciplines that support technology
* provide students opportunity to explore differences between technological knowledge and knowledge from other disciplines
* guide students to analyse a range of examples of technological practices and to identify the knowledge and skills that informed initial design decisions and ongoing manufacturing decisions. Examples should be drawn from within their own and others’ technological practice and allow students to gain insight into how technological knowledge and skills, and knowledge and skills from other disciplines, can support technology.

**Indicators**

Students can:

* identify examples where technology has changed people’s sensory perception and/or physical abilities and discuss the potential short and long term impacts of these
* identify examples of creative and critical thinking in technological practice
* identify and categorise knowledge and skills from technology and other disciplines that have informed decisions in technological development and manufacture

Level 5

**Achievement objective**

Students will:

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

**Teacher guidance**

To support students to develop understanding of characteristics of technology at level 5, teachers could:

* provide students with opportunities to examine and debate examples of innovative technological developments. Examples should draw from the past and present and allow students to explore how creative and critical thinking impacts on developments and how what could happen and what should happen were considered
* guide students to analyse a range of examples of technologies to examine how people’s perceptions and/or level of acceptance has influenced the practices and decisions underpinning their development and implementation. Examples should be drawn from the past and present to allow students to gain insight into the influence past experiences have on the perception and acceptance of existing and future technological practice and outcomes
* guide students to analyse a range of examples of technological practices to identify codified technological knowledge that was used to inform design and manufacturing decisions. Technological knowledge becomes codified when technological experts consider it is useful for a number of situations. Codified technological knowledge refers to such things as codes of standards, material tolerances, and codes of practice including codes of ethics, intellectual property codes, etc. Examples should be drawn from within their own and others’ technological practice
* provide students with opportunities to discuss the role of codified knowledge in technology and understand why and how particular knowledge becomes codified. Codified knowledge provides others with access to established knowledge and procedures that have been shown to support successful technological developments in the past and can serve to remind technologists of their responsibilities. In this way codified knowledge can be used to provide constructional, ethical and/or legal compliance constraints on contemporary technological practice
* provide students with opportunities to discuss how established codified knowledge can be challenged and that ongoing revision is important due to the changing made, social and natural world. For example, the development of new materials, tools, and/or techniques, shifting social, political and environmental needs and understandings, and technological outcome malfunction, can all serve to challenge existing codified knowledge.

**Indicators**

Students can:

* discuss examples of creative and critical thinking that have supported technological innovation
* explain how people’s past experiences of technology (both in terms of the nature of practices undertaken and the initial development and ongoing manufacturing of outcomes) influences their perception of technology
* explain how people’s perception of technology influences their acceptance of technology
* explain how people’s perception of technology impacts on future technological development
* explain how and why technological knowledge becomes codified
* explain the role codified knowledge plays in technological practice.

Level 6

**Achievement objective**

Students will:

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

**Teacher guidance**

To support students to develop understanding of characteristics of technology at level 6, teachers could:

* support students to analyse a range of examples of technological development and explain how different disciplines have impacted on the nature of the technological practice undertaken and how this in turn has influenced understandings of the contributing disciplines. Examples should include those from the students own work and others’ technological practice and allow students to gain insight into the interdisciplinary nature of technological practice
* support students to explore examples of where collaborative work between technologists and/or other people has led to new possibilities for technological practice and/or outcome design. Examples should include those from the students own work and others’ technological practice and allow students to gain insight into the way idea generation and exploration can be enhanced through collaboration
* support students to understand that interdisciplinary collaboration provides exciting opportunities to ‘work at the boundaries’ of established fields and appreciate that this may lead to situations where no codified technological knowledge exists to guide practice, tensions between people may arise, and a greater number of unknown consequences may result
* provide students with opportunities to discuss how the interdisciplinary nature of technology and the need for collaboration can influence how technology is understood and accepted by different groups in both positive and negative ways.

**Indicators**

Students can:

* explain how different disciplines have impacted on technological practice
* explain why collaboration is important in technological developments that involve interdisciplinary work
* explain how interdisciplinary collaboration in technology can enhance and/or inhibit technological development and implementation
* describe examples of interdisciplinary collaboration in technology that has influenced, or could influence public understanding and acceptance of technology.

Level 7

**Achievement objective**

Students will:

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

**Teacher guidance**

To support students to develop understanding of characteristics of technology at level 7, teachers could:

* provide students with opportunities to discuss the inseparable nature of technology and society and guide them to explore examples to analyse instances of the complex intertwining of society and technology. Contexts for exploration could be selected from areas such as; communication practices and communication technologies, life experiences and medical technologies, sporting endeavours and equipment/enhancement technologies
* provide students with opportunities to discuss technology as a field of on-going contestation and competing priorities that require resolution through complex decision making and guide students to recognise the role of functional and practical reasoning in such decision making
* guide students to critically analyse examples of technological practice to gain insight into how technologists identify and deal with contestable issues by understanding socio-cultural influences. Socio-cultural influences include such things as: social; cultural; political; environmental; and economic influences. This can be done through understanding the socio-cultural influences on fundamental aspects of technology in a particularly defined setting. Aspects of technology include such things as: problem identification and refinement to establish needs and opportunities; the development of designs and technological outcomes; resource selection and justification; post development manufacturing; implementation and ongoing in situ evaluation; maintenance and disposal; and ethical, social and moral responsibilities
* guide students to critically analyse examples of technological practice to gain insight into how technologists take competing priorities into account during decision making. Competing priorities include such things as: innovation versus acceptance/continuation; time versus quality; majority acceptance versus acceptable to all; social versus environmental benefit; ethical versus legal compliance etc.
* guide students to critically analyse examples of innovative technological developments. Examples should draw from the past and present and allow students to gain insight into how informed creativity, critical evaluation and the pushing of boundaries can support innovative decision making and outcomes. Opportunity should also be provided to critique innovative developments in terms their impact on how technology is understood and accepted by different groups in both positive and negative ways.

**Indicators**

Students can:

* discuss examples to illustrate how socio-cultural factors influence technology and in turn technology influences socio-cultural factors in complex and ongoing ways
* explain technology as a field of on-going contestation and why competing priorities arise
* explain how influences and priorities have been managed in technological decisions of the past
* explain how critical evaluation, informed creativity and boundary pushing impacts on technological development and public views of technology.

Level 8

**Achievement objective**

Students will:

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

**Teacher guidance**

To support students to develop understanding of characteristics of technology at level 8, teachers could:

* support students to critically analyse examples of technological developments and their consequences, known and unknown and intended and unintended, to gain insight into the social responsibility technologists have due to the interventionist nature of technology. Examples should allow students to gain insight into how technology has real and long term impacts
* for the made, natural and social world. Students should be supported to discuss the implications this has for technologists’ collective responsibility
* support students to understand that technology can challenge people’s views of what it is to be ‘human’. Contexts for exploration could include contemporary developments in the area of communication technologies, artificial intelligence, human-robotic interfaces, second-life gaming, genetic engineering, nanotechnology etc.
* support students to explore and critique the role of technology in the creation of sustainable environments. This would include discussion of such things as the ethics of designing for limited technological outcome lifespan, designing to comply with minimal engineering ideals, utilizing and developing sustainable materials, reducing energy consumption and waste, developing and managing socio-technological environments, etc.

**Indicators**

Students can:

* discuss technology as intervention by design and explain the impacts and implications of this
* discuss why technology can challenge people’s views of what it is to be ‘human’
* critique the role of technology in the development of sustainable environments
* discuss future scenarios where technology plays out different roles and justify projected impacts.