# Characteristics of Technological Outcomes

Technological outcomes are products and systems developed by means of technological practice for a specific purpose.

A technological outcome:

* is evaluated in terms of its fitness for purpose
* can be described in terms of its physical and functional natures
* must be interpreted in relation to the social and historical context in which it was developed and used

An outcome’s proper function is its intended and/or socially accepted purpose. Alternative functions are successful functions that have been discovered or developed by users. Outcomes that do not successfully fulfil their intended functions are malfunctions.

## Indicators of progression

Level 1

**Achievement objective**

Students will:

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

**Teacher guidance**

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

* provide students with a range of contemporary and historical technological products and systems and encourage them to explore these through such things as: using, ‘playing’, dismantling and rebuilding as appropriate
* guide students to recognise the products and systems explored as technological outcomes developed by people to be suitable for particular users
* guide students to identify technological outcomes when presented with a collection of technological and non-technological objects and systems
* guide students to identify the physical nature of technological outcomes. The physical nature of technological outcomes refers to its physical attributes. For example; size, shape, colour, smell, texture, components, guide students to identify the functional nature of technological outcomes. The functional nature of technological outcomes refers to its functional attributes. That is, what the outcome or part of the outcome does. For example; provides grip, transports mass, stores, joins surfaces.

**Indicators**

Students can:

* identify technological outcomes in a group of technological and non- technological objects and systems
* identify who might use particular technological outcomes
* identify the physical attributes of technological outcomes
* identify the functional attributes of technological outcomes.

Level 2

**Achievement objective**

Students will:

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

**Teacher guidance**

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

* provide students with a range of technological outcomes and non-technological objects and guide them to identify which of these could be described as technological outcomes and explain why. Technological outcomes are defined as fully realised products and systems, created by people for an identified purpose through technological practice. Once the technological outcome is placed in situ, no further design input is required for the outcome to function. Taking this definition into account, technological outcomes can be distinguished from natural objects (such as trees and rocks etc.), and works of art, and other outcomes of human activity (such as language, knowledge, social structures, organisational systems etc.)
* provide students with a range of contemporary and historical technological outcomes and encourage them to explore these through such things as: using, ‘playing’, dismantling and rebuilding as appropriate
* guide students to identify the technological outcomes explored as products and/or systems. Identifying an outcome as a product or system will influence the description of its physical nature. For example, if a technological outcome is identified as a product, the focus for describing its physical nature will be on the physical attributes afforded
* by the shaping, cutting, finishing etc. of the materials it is made from. If a technological outcome is identified as a system, the focus for describing its physical nature will be on the physical attributes afforded by the components within it and how they are connected
* guide students to identify the relationship between physical and functional attributes in technological outcomes. For example the flat bottom of a cup (physical attribute) allows it to be stable on a flat surface (functional attribute)
* guide students to recognise that physical and functional attributes can give clues as to who might use the technological outcome for its intended purpose.

**Indicators**

Students can:

* describe what technological outcomes are and explain how they are different to natural objects and other things created by people
* identify a technological product and describe relationships between the physical and functional attributes
* identify a technological system and describe relationships between the physical and functional attributes
* describe the physical and/or functional attributes of a technological outcome that provide clues as to who might use it.

Level 3

**Achievement objective**

Students will:

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

**Teacher guidance**

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

* provide students with a range of technological outcomes with unknown functions to explore and guide them to make informed suggestions regarding who might use them and the possible function they could perform, as based on an exploration and analysis of their physical nature
* provide students with the opportunity to explore a range of technological outcomes that are similar in their functional nature but have differences in their physical natures and vice versa
* support students to understand that the intended use and users, socio-cultural and physical locations all combine to determine how the physical and functional attributes can be best matched for optimum fitness for purpose. For example;
* a selection of brooms could be described as having similar functional attributes (clean an area by sweeping unwanted material to another location, able to be used while standing) but whether they are for a young child to sweep dust of the kitchen floor or for an adult to sweep water off driveways will mean quite different physical attributes will be decided upon to ensure the broom is fit for its purpose. Alternatively, a selection of brushes could be described as having similar physical natures (all have flexible bristles) but the way in which they are used will determine their functional nature as to whether they function to clean, act as a reservoir to spread a substance, or to separate something
* guide students to understand the relationship between the physical and functional nature in a technological outcome. That is, the functional nature requirements set boundaries around the suitability of proposed physical nature options (for example a chair for a child will constrain the dimensions of the chair) and the physical nature options will set boundaries around what functional nature is feasible for a technological outcome at any time (for example heavy cast iron pots will not be suitable for everyday use by the elderly)
* guide students to understand that the judgment of a technological outcome as a ‘good’ or ‘bad’ is related to the match between its physical and functional nature, its intended user/s and the context they would normally use it in.

**Indicators**

Students can:

* describe possible users and functions of a technological outcome based on clues provided by its physical attributes
* describe examples of technological outcomes with different physical natures that have similar functional natures
* describe examples of technological outcomes with different functional natures that have similar physical natures
* explain why a technological outcome could be called a ‘good’ or ‘bad’ design.

Level 4

**Achievement objective**

Students will:

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

**Teacher guidance**

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

* provide students with the opportunity to explore examples of technological outcomes and guide them to identify their proper function. Proper function can be determined from an analysis of both the design intent that drove the outcome’s development as well as how it is most commonly used
* provide students with examples of technological outcomes where the proper function of a technological outcome has changed over time because an alternative use was successful and then became socially accepted as the norm
* provide students with examples of technological outcomes that have been used unsuccessfully for other purposes and/or in different environments and support them to identify the negative impacts. Impacts may be in terms of expected action not resulting, damage to the outcome, injury to the user, the damage to the social or physical environment - or any combination of these
* provide students with a description of an identified purpose (e.g. a stated need or opportunity) and other relevant details. These details should include such things as intended users and the environment in which it is to be situated. Support students to generate potential designs for a technological outcome and describe the physical and functional attributes it would require if it could be justified as a good design leading to an outcome that was fit for purpose.

**Indicators**

Students can:

* explain the proper function of existing technological outcomes
* explain how technological outcomes have been successfully used by end-users for purposes other than what they were originally designed for
* explain how technological outcomes have been unsuccessfully used by end-users for purposes other than what they were originally designed and discuss the impacts of this
* explain possible physical and functional attributes for a technological outcome when provided with intended user/s, a purpose, and relevant social, cultural and environmental details to work within.

Level 5

**Achievement objective**

Students will:

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

**Teacher guidance**

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

* guide students to analyse a range of examples of how technological outcomes have been evaluated as fit for purpose according to its appropriateness to the time and context of its development. Examples should be drawn from within students own and others’ technological practice and allow students to examine the criteria used to make the judgment
* guide students to explore a range of examples of technological outcome failure and support them identify those that are examples of malfunction. Malfunction refers to a single event failure of a technological outcome as opposed to failure due to ‘wear’ or reaching the end of the outcome’s designed lifespan
* guide students to analyse examples of technological outcome malfunction to gain insight into how such events can inform decisions about the future of the outcome. Decisions may be made to withdraw or modify the technological outcome or retain the outcome with modified operational parameters. Operational parameters refer to the boundaries and/or conditions within which the outcome has been designed to function.

**Indicators**

Students can:

* explain why time and context are important criteria for judging the fitness for purpose of technological outcomes
* evaluate past technological outcomes in the light of experiences subsequent to their development and/or contemporary understandings
* explain what is meant by the malfunction of technological outcomes
* explain the cause/s of particular technological outcome malfunction.

Level 6

**Achievement objective**

Students will:

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

**Teacher guidance**

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

* support students to discuss particular technological outcomes as a product and a system and support them to understand that the categorisation of product or system is not an inherent property of the outcome, but rather how it is perceived by people in order to describe, and/or analyse it
* guide students to explore examples of socio-technological environments to explain how technological outcomes (products and systems) and non-technological entities and systems (people, natural environments, political systems etc.) interact together. Examples should be drawn from past, present and possible future socio- technological environments. Socio-technological environments include such things as communication networks, hospitals, transport systems, waste disposal, recreational parks, factories, power plant etc.
* support students to understand that interactions in socio-technological environments are complex and result in dynamic relationships between technological outcomes, entities and systems. Guide students to explore the influences and impact of these relationships on the way technological outcomes are developed and manufactured.

**Indicators**

Students can:

* explain why some technological outcomes can be described as both a product and a system
* describe socio-technological environments and the relationships of technological outcomes involved
* discuss the interactions between technological outcomes, people, and social and physical environments within particular socio-technological environments
* explain why understanding socio-technological environments allow technological outcomes to be better understood.

Level 7

**Achievement objective**

Students will:

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

**Teacher guidance**

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

* provide students with opportunities to discuss how malfunction can impact on the design or manufacturing of similar and related technological outcomes
* provide students with opportunities to identify that form refers to the physical nature of a technological outcome and function refers to the functional nature of the outcome. Design elements related to an outcome’s physical nature include such things as: colour; movement; pattern; proportion; harmony; taste etc. Design elements related to an outcome’s functional nature include such things as strength; durability; stability; efficiency; nutritional value etc. Design elements are prioritised in different ways as determined by such things as a designer’s intent for the outcome, understandings of materials, the socio-cultural location the outcome is to be situated, professional and personal beliefs etc.
* support students to critically analyse the physical and functional nature of technological outcomes to identify how design elements appear to have been prioritised and to explain how such a prioritisation could be justified
* support students to analyse the prioritisation of design elements in particular technological outcomes with respect to the intended purpose of the technological outcome, intended users and specific context, the wider socio-technological environment it was a part of, and the era of its development and to make informed judgments as to the outcome’s fitness for purpose.

**Indicators**

Students can:

* explain how malfunction can impact on the design and/ or manufacture of similar and related technological outcomes
* justify how the design elements appear to have been prioritised in technological outcomes
* justify the fitness for purpose of technological outcomes in terms of their physical and functional nature and socio-technological environment/s they are used within.

Level 8

**Achievement objective**

Students will:

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

**Teacher guidance**

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

* provide students with opportunity to extend their understanding of fitness for purpose. This extended notion is called ‘fitness for purpose in its broadest sense’ and refers to the ‘fitness’ of the outcome itself as well as the practices used to develop the outcome (e.g. such things as the sustainability of resources used, ethical nature of testing practices, cultural appropriateness of trialling procedures, determination of lifecycle and ultimate disposal)
* support students to explore the implications of a commitment to developing technological outcomes that are fit for purpose in the broadest sense on the design, development and manufacturing of technological outcomes
* support students to critically analyse a range of technological outcomes to evaluate their fitness for purpose, in its broadest sense. The evaluation will be based on the physical and functional nature of the outcome, the historical, cultural, social, and geographical location of the final outcome as well as its development, and any information available regarding its performance over time
* support students to explore possible benefits and disadvantages of employing the notion of fitness for purpose in its broadest sense in different contexts related to the design and development, manufacture, evaluation and analysis of technological outcomes.

**Indicators**

Students can:

* discuss the implications of viewing fitness for purpose in its broadest sense on the design and development of technological outcomes
* discuss the implications of viewing fitness for purpose in its broadest sense on the manufacture of technological outcomes
* justify the fitness for purpose, in its broadest sense, of technological outcomes
* debate the value of employing the notion of ‘fitness for purpose in its broadest sense’ as related to: the design and development, manufacture, evaluation and analysis of technological outcomes.