TECHNOLOGICAL PRACTICE: INDICATORS OF PROGRESSION

LEVEL ONE

Teachrs should establish if students hold any misconceptions or partial understandings that would inhibit students meeting the level one achievement objectives for the technological practice, and plan learning experiences to challenge and/or progress these as guided by the level one Indicators below.

ACHIEVEMENT OBJECTIVE
Students will:
• Describe the outcome they are developing and identify the attributes it should have, taking account of the need or opportunity and the resources available.

ACHIEVEMENT OBJECTIVE
Students will:
• Outline a general plan to support the development of an outcome, identifying appropriate steps and resources.

ACHIEVEMENT OBJECTIVE
Students will:
• Investigate a context to communicate potential outcomes. Evaluate these against identified attributes, select and develop an outcome in keeping with the identified attributes.

ACHIEVEMENT OBJECTIVE
Students will: Explain the outcomes they are developing and describe the attributes it should have, taking account of the need or opportunity and the resources available.

ACHIEVEMENT OBJECTIVE
Students will:
• Develop a plan that identifies the key stages and the resources required.

ACHIEVEMENT OBJECTIVE
Students will:
• Provide an outcome in keeping with the identified attributes.

ACHIEVEMENT OBJECTIVE
Students will:
• Provide a range of materials, components, and/or software for each key stage. Teachers should ensure all resources provided are appropriate for use and students should only be responsible for selecting particular materials/components and/or software from these resources.

ACHIEVEMENT OBJECTIVE
Students will:
• Identify the particular materials, components and/or software they might use.

ACHIEVEMENT OBJECTIVE
Students will:
• Identify the particular materials, components and/or software they might use.

ACHIEVEMENT OBJECTIVE
Students will:
• Describe potential outcomes, through drawing, modelling and/or verbally.

ACHIEVEMENT OBJECTIVE
Students will:
• Describe potential outcomes, through drawing, modelling and/or verbally.

ACHIEVEMENT OBJECTIVE
Students will:
• Describe potential outcomes, through drawing, modelling and/or verbally.

ACHIEVEMENT OBJECTIVE
Students will:
• Describe potential outcomes, through drawing, modelling and/or verbally.

TEACHER GUIDANCE
To support students to undertake brief development planning at level one teachers could:
• Ensure that there is a brief which identifies the need or opportunity and the resources available
• Provide a range of materials, components and/or software for each key stage. Teachers should ensure all resources provided are appropriate for use and students should only be responsible for selecting particular materials/components and/or software from these resources.

TEACHER GUIDANCE
To support students to undertake brief development planning and evaluation at level one teachers could:
• Ensure that there is a brief which identifies the need or opportunity and the resources available
• Ensure that there is a brief with attributes against which a developed outcome can be evaluated
• Establish an environment that encourages and supports student innovation when generating design ideas
• Provide opportunities to develop drawing and modelling skills to communicate and explore design ideas. Emphasis should be on progressing 2D and 3D drawing skills and using manipulative media such as plasters, wire, card etc
• Provide opportunities to develop skills to select from these materials and resources available and guide students to take this into account when identifying the attributes for the outcome
• Provide an overview of the resources available and guide them to take this into account when identifying the attributes for the outcome

TEACHER GUIDANCE
To support students to undertake outcome development and evaluation at level one teachers could:
• Ensure that there is a brief which identifies the need or opportunity and the resources available
• Ensure that there is a brief with attributes against which a developed outcome can be evaluated
• Establish an environment that encourages and supports student innovation when generating design ideas
• Provide opportunities to develop drawing and modelling skills to communicate and explore design ideas. Emphasis should be on progressing 2D and 3D drawing skills and using manipulative media such as plasters, wire, card etc
• Provide opportunities to develop skills required to produce their outcome

LEVEL TWO

Teachers should establish if students have developed robust level one competencies and are ready to begin working towards level two achievement objectives for the technological practice, and plan learning experiences to progress these as guided by the level two Indicators below.

ACHIEVEMENT OBJECTIVE
Students will:
• Describe the nature of an intended outcome, explaining how it addresses the need or opportunity. Describe the key attributes that enable development and evaluation of an outcome.

ACHIEVEMENT OBJECTIVE
Students will:
• Underline planning to identify the key stages and resources required to develop an outcome. Revisit planning to include reviews of progress and identify implications for subsequent decision making.

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

TEACHER GUIDANCE
To support students to undertake brief development at level two teachers could:
• Ensure that there is a brief which identifies the need or opportunity and the resources available
• Provide a range of materials, components, and/or software for students to select those suitable for their use. Teachers should ensure all resources provided are appropriate for use and students should only be responsible for selecting particular materials/components and/or software from these resources.

TEACHER GUIDANCE
To support students to undertake outcome development and evaluation at level two teachers could:
• Ensure that there is a brief which identifies the need or opportunity and the resources available
• Ensure that there is a brief with attributes against which a developed outcome can be evaluated
• Establish an environment that encourages and supports student innovation when generating design ideas
• Provide opportunities to develop drawing and modelling skills to communicate and explore design ideas. Emphasis should be on progressing 2D and 3D drawing skills and using manipulative media such as plasters, wire, card etc
• Provide opportunities to develop skills required to produce their outcome
• Guide students to evaluate their outcome in terms of the need or opportunity.

TEACHER GUIDANCE
To support students to undertake outcome development and evaluation at level two teachers could:
• Ensure that there is a brief which identifies the need or opportunity and the resources available
• Ensure that there is a brief with attributes against which a developed outcome can be evaluated
• Establish an environment that encourages and supports student innovation when generating design ideas
• Provide opportunities to develop drawing and modelling skills to communicate and explore design ideas. Emphasis should be on progressing 2D and 3D drawing skills and using manipulative media such as plasters, wire, card etc
• Provide opportunities to develop skills required to produce their outcome
• Guide students to evaluate their outcome in terms of the need or opportunity.

TEACHER GUIDANCE
To support students to undertake outcome development and evaluation at level two teachers could:
• Ensure that there is a brief which identifies the need or opportunity and the resources available
• Ensure that there is a brief with attributes against which a developed outcome can be evaluated
• Establish an environment that encourages and supports student innovation when generating design ideas
• Provide opportunities to develop drawing and modelling skills to communicate and explore design ideas. Emphasis should be on progressing 2D and 3D drawing skills and using manipulative media such as plasters, wire, card etc
• Provide opportunities to develop drawing and modelling skills to communicate and explore design ideas. Emphasis should be on progressing 2D and 3D drawing skills and using manipulative media such as plasters, wire, card etc
• Provide opportunities to develop skills required to produce their outcome
• Guide students to evaluate their outcome in terms of the need or opportunity.

TEACHER GUIDANCE
To support students to undertake outcome development and evaluation at level three teachers could:
• Ensure that there is a brief which identifies the need or opportunity and the resources available
• Provide a range of materials, components, and/or software for students to select those suitable for their use. Teachers should ensure all resources provided are appropriate for use and students should only be responsible for selecting particular materials/components and/or software from these resources.

TEACHER GUIDANCE
To support students to undertake outcome development and evaluation at level three teachers could:
• Ensure that there is a brief which identifies the need or opportunity and the resources available
• Provide a range of materials, components, and/or software for each key stage. Teachers should ensure all resources provided are appropriate for use and students should only be responsible for selecting particular materials/components and/or software from these resources.

TEACHER GUIDANCE
To support students to undertake outcome development and evaluation at level three teachers could:
• Ensure that there is a brief which identifies the need or opportunity and the resources available
• Provide a range of materials, components, and/or software for each key stage. Teachers should ensure all resources provided are appropriate for use and students should only be responsible for selecting particular materials/components and/or software from these resources.

TEACHER GUIDANCE
To support students to undertake outcome development and evaluation at level three teachers could:
• Ensure that there is a brief which identifies the need or opportunity and the resources available
• Provide a range of materials, components, and/or software for each key stage. Teachers should ensure all resources provided are appropriate for use and students should only be responsible for selecting particular materials/components and/or software from these resources.

INDICATORS
Students can:
• Identify the particular materials, components and/or software they might use.

INDICATORS
Students can:
• Identify the particular materials, components and/or software they might use.

INDICATORS
Students can:
• Identify the particular materials, components and/or software required for each key stage.

INDICATORS
Students can:
• Identify the particular materials, components and/or software required for each key stage.

INDICATORS
Students can:
• Describe potential outcomes, through drawing, modelling and/or verbally.

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LEVEL FOUR

TECHNOLOGICAL PRACTICE: INDICATORS OF PROGRESSION

Achievement Objective

Students will:
- justify the nature of an intended outcome in relation to the need or opportunity and describe the key attributes identified in stakeholder feedback, which will inform the development of an outcome and its evaluation.
- support students to undertake brief development at level four teachers could:
  - provide an appropriate context and purpose that allows students to access resources (including key stakeholders);
  - guide students to identify a need or opportunity, develop a conceptual statement and support students to understand the physical and social nature required of their outcome, and how the key attributes relate to this;
  - guide students to consider the key stakeholders and the environment where the outcome will be located.

Indicators

Students can:
- identify a need or opportunity, and record key stages, associated resources or outcomes to be undertaken, with progress review points clearly indicated;
- establish a conceptual statement that communicates the nature of the outcome and why such an outcome should be developed;
- establish the key attributes for the outcome identified by stakeholders;
- communicate key attributes that allow an outcome to be evaluated as fit for purpose.

LEVEL FIVE

Achievement Objective

Students will:
- undertake ongoing evaluation and feedback, involving reflection, analysis, finalising the physical and social outcomes. Use the information gained to select and justify ongoing planning for the development of an outcome through to completion.

Indicators

Students can:
- critically analyse own and others’ outcomes to identify the development of ideas for future development. Undertake ongoing functional modelling and evaluation that takes account of key stakeholder feedback and feedback in the physical and social environments. Use the information gained to select and justify ongoing planning for the development of an outcome through to completion.
- plan learning experiences to progress to these as guided by the level five indicators below.

LEVEL SIX

Achievement Objective

Students will:
- critically analyse their own and others’ past and current planning and evaluate feedback in order to make informed selection and effective ongoing planning.
- use these to support and justify ongoing planning that will see the development of an outcome through to completion.

Indicators

Students can:
- critically analyse own and others’ outcomes to identify the development of ideas for future development. Undertake ongoing functional modelling and evaluation that takes account of key stakeholder feedback and feedback in the physical and social environments. Use the information gained to select and justify ongoing planning for the development of an outcome through to completion.

October 2010 Version. For context and Curriculum Support information, see www.techlink.org.nz/curriculum-support
Teaching Practice: Indicators of Progression

**TECHNOLOGICAL PRACTICE: INDICATORS OF PROGRESSION**

**LEVEL SEVEN**

**Brief Development**
- Students will... (Achievement Objective)
- Students will... (Achievement Objective)

**Planning for Practice**
- Students will... (Teacher Guidance)
- Students can: (Teacher Guidance)

**Outcome Development & Evaluation**
- Students will... (Achievement Objective)
- Students can: (Teacher Guidance)

**LEVEL EIGHT**

**Brief Development**
- Students will... (Achievement Objective)
- Students will... (Achievement Objective)

**Planning for Practice**
- Students will... (Teacher Guidance)
- Students can: (Teacher Guidance)

**Outcome Development & Evaluation**
- Students will... (Achievement Objective)
- Students can: (Teacher Guidance)

**TEACHER GUIDANCE**

To support students to undertake brief development at level seven teachers could:
- provide a context that offers a range of issues for students to explore
- guide students to select an authentic issue within the context
- support students to understand the physical and functional nature required of their outcome
- support students to justify the nature of their outcome in relation to the issue and context
- support students to explore the context to select an issue
- support students to develop specifications and provide justifications for them taken from stakeholder feedback, and evaluate suitability of materials, components, software, equipment and/or hardware suitable for their outcome.

To support students to undertake outcome development and evaluation at level seven teachers could:
- ensure that there is a brief with clear specifications against which an outcome can be evaluated
- establish the requirements that the proposed outcome will meet
- support students to critically analyse their own and others’ past and current planning and management practices thus the practices used to develop the outcome can be evaluated
- establish an environment that supports student innovation and encourages critical analysis of existing outcomes
- support students to develop design ideas for outcomes that are justified as feasible
- support students to undertake prototyping to gain evidence that shows clear connections between the outcome and the need for any changes to enhance the outcome
- support students to critically analyse the ways in which the fitness of the proposed outcome can be evaluated
- ensure that there is a brief with clear specifications against which a proposed outcome can be evaluated
- establish the requirements that the developed outcome can be evaluated
- support students to critically analyse evaluative practices used when functional modelling
- support students to develop and justify specifications that will allow the evaluation of the outcome and its development strategy to be fitted for purpose
- generate design ideas that are informed by research and critical analysis of existing outcomes
- critically analyse existing planning tools and project management practices to inform the selection of planning tools appropriate for the level seven teacher’s context, and provide feedback to support any revisions to planning tools
- use planning tools to set achievable goals, manage all resources, plan critical review points, and revise goal and resources as necessary to ensure the effective completion of an outcome
- use planning tools to provide evidence for any revisions made at critical review points and for any changes to improve the effectiveness of the planning tools used.

**INDICATORS**

**INDICATORS**

- explain the context to select an issue
- identify a need or opportunity relevant to their selected issue
- establish a conceptual statement that justifies the nature of the outcome and why such an outcome is required for the level seven teacher’s context, and for recording evidence to support any revisions to planning tools
- use planning tools to set achievable goals, manage all resources, plan critical review points, and revise goal and resources as necessary to ensure the effective completion of an outcome
- use planning tools to provide evidence for any revisions made at critical review points and for any changes to improve the effectiveness of the planning tools used.

- critically analyse existing planning tools and project management practices to inform the selection of planning tools appropriate for the level seven teacher’s context, and for recording evidence to support any revisions to planning tools
- use planning tools to set achievable goals, manage all resources, plan critical review points, and revise goal and resources as necessary to ensure the effective completion of an outcome
- use planning tools to provide evidence for any revisions made at critical review points and for any changes to improve the effectiveness of the planning tools used.

**TEACHER GUIDANCE**

To support students to undertake outcome development and evaluation at level eight teachers could:
- ensure that there is a brief with clear specifications against which an outcome can be evaluated
- establish the requirements that the proposed outcome will meet
- support students to critically analyse their own and others’ past and current planning and management practices thus the practices used to develop the outcome can be evaluated
- establish an environment that supports student innovation and encourages critical analysis of existing outcomes
- support students to develop design ideas for outcomes that are justified as feasible
- support students to undertake prototyping to gain evidence that shows clear connections between the outcome and the need for any changes to enhance the outcome
- support students to critically analyse the ways in which the fitness of the proposed outcome can be evaluated
- ensure that there is a brief with clear specifications against which a proposed outcome can be evaluated
- establish the requirements that the developed outcome can be evaluated
- support students to critically analyse evaluative practices used when functional modelling
- support students to develop and justify specifications that will allow the evaluation of the outcome and its development strategy to be fitted for purpose
- generate design ideas that are informed by research and critical analysis of existing outcomes
- critically analyse existing planning tools and project management practices to inform the selection of planning tools appropriate for the level seven teacher’s context, and for recording evidence to support any revisions to planning tools
- use planning tools to set achievable goals, manage all resources, plan critical review points, and revise goal and resources as necessary to ensure the effective completion of an outcome
- use planning tools to provide evidence for any revisions made at critical review points and for any changes to improve the effectiveness of the planning tools used.

- critically analyse existing planning tools and project management practices to inform the selection of planning tools appropriate for the level seven teacher’s context, and for recording evidence to support any revisions to planning tools
- use planning tools to set achievable goals, manage all resources, plan critical review points, and revise goal and resources as necessary to ensure the effective completion of an outcome
- use planning tools to provide evidence for any revisions made at critical review points and for any changes to improve the effectiveness of the planning tools used.

- establish the requirements that the proposed outcome will meet
- support students to critically analyse their own and others’ past and current planning and management practices thus the practices used to develop the outcome can be evaluated
- establish an environment that supports student innovation and encourages critical analysis of existing outcomes
- support students to develop design ideas for outcomes that are justified as feasible
- support students to undertake prototyping to gain evidence that shows clear connections between the outcome and the need for any changes to enhance the outcome
- support students to critically analyse the ways in which the fitness of the proposed outcome can be evaluated
- ensure that there is a brief with clear specifications against which a proposed outcome can be evaluated
- establish the requirements that the developed outcome can be evaluated
- support students to critically analyse evaluative practices used when functional modelling
- support students to develop and justify specifications that will allow the evaluation of the outcome and its development strategy to be fitted for purpose
- generate design ideas that are informed by research and critical analysis of existing outcomes
- critically analyse existing planning tools and project management practices to inform the selection of planning tools appropriate for the level seven teacher’s context, and for recording evidence to support any revisions to planning tools
- use planning tools to set achievable goals, manage all resources, plan critical review points, and revise goal and resources as necessary to ensure the effective completion of an outcome
- use planning tools to provide evidence for any revisions made at critical review points and for any changes to improve the effectiveness of the planning tools used.
# Nature of Technology: Indicators of Progression

## Level One

**Achievement Objective:** Students will understand that technological outcomes have made a significant impact on the social and cultural world.

### Characteristics of Technology
- **Understanding:** how and why a technological outcome has an impact on society and the environment.

### Characteristics of Technological Outcomes
- **Understanding:** that technological outcomes involve design and planning.

## Level Two

**Achievement Objective:** Students will understand that technological outcomes involve design and planning.

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

- **Teacher Guidance:** To support students to develop understanding of characteristics of technological outcomes at level 2, teachers could:
  - **Achievement Objective:** Students will identify that technological knowledge is knowledge that technologists agree is important for the development of a technological outcome.
  - **Indicators:** Students can:
    - identify technological outcomes in a group of technological and non-technological objects and systems.
    - identify the physical attributes of technological outcomes.
    - identify the functional attributes of technological outcomes.

## Level Three

**Achievement Objective:** Students will understand that technological outcomes involve design and planning.

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

- **Teacher Guidance:** To support students to develop understanding of characteristics of technology at level 3, teachers could:
  - **Achievement Objective:** Students will identify that technological knowledge is knowledge that technologists agree is important for the development of a technological outcome.
  - **Indicators:** Students can:
    - describe examples of technological outcomes with different physical natures and vice versa.
    - describe the relationship between their physical and functional natures.

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**Indicators Students can:**
- **Identify that technology helps to:**
- **Identify that technology involves:**
- **Identify that technological practice involves:**
  - what people need or want.
- **Determine what is to:**
- **Make and evaluate an outcome:**

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**Indicators Students can:**
- **Identify technological outcomes in:**
- **Identify the sociocultural and environmental:**
- **Identify the physical attributes of:**
- **Identify the functional attributes of:**

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**Indicators Students can:**
- **Describe how technological outcomes are:**
- **Identify the physical and functional:**
- **Identify the physical and functional attributes of:**
- **Using technology has had an impact on:**

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**Indicators Students can:**
- **Describe how social and environmental outcomes can influence:**
- **Describe examples of technological outcomes with different functional:**
- **Describe examples of technological outcomes with different physical:**
- **Describe the outcomes a technological outcome has had:**

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**Indicators Students can:**
- **Describe possible uses and functions of a technological outcome:**
- **Describe examples of technological outcomes with different physical:**
- **Identify what people decided to:**
- **Describe examples of technological outcomes with different functional:**

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**Indicators Students can:**
- **Identify the sociocultural and environmental:**
- **Identify the physical and functional:**
- **Identify why a technological outcome has:**
- **Identify the functional and physical:**

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**Indicators Students can:**
- **Identify social and environmental:**
- **Identify the physical and functional:**
- **Identify the relationship between:**
- **Identify the functional and physical:**

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**Indicators Students can:**
- **Describe how technological outcomes have:**
- **Identify the relationship between:**
- **Identify the functional and physical:**
- **Identify the functional and physical:**

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**Indicators Students can:**
- **Identify what people decided to:**
- **Describe how social and environmental outcomes can influence:**
- **Describe examples of technological outcomes with different social:**
- **Describe examples of technological outcomes with different social:**

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**Indicators Students can:**
- **Describe the relationship between:**
- **Identify the physical and functional:**
- **Identify the physical and functional:**
- **Identify the physical and functional:**

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**Indicators Students can:**
- **Describe how technological outcomes are:**
- **Identify the physical and functional:**
- **Identify the physical and functional:**
- **Identify the physical and functional:**

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**Indicators Students can:**
- **Describe how technological outcomes have:**
- **Identify the relationship between:**
- **Identify the functional and physical:**
- **Identify the functional and physical:**

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**Indicators Students can:**
- **Identify the physical and functional:**
- **Identify the physical and functional:**
- **Identify the physical and functional:**
- **Identify the physical and functional:**

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**Indicators Students can:**
- **Describe how technological outcomes have:**
- **Identify the relationship between:**
- **Identify the functional and physical:**
- **Identify the functional and physical:**
TEACHER GUIDANCE
To support students to develop understanding of characteristics of technology at level 4, teachers could:

- guide students to analyse a range of examples of technological outcomes that have changed over time because an alternative use was subsequently developed and became socially accepted as the new norm.
- provide students with examples of technological outcomes where the purpose of a technological outcome has changed over time because a different use was subsequently developed and became socially accepted as the norm.
- provide students with examples of technological outcomes that have been evaluated as fit for purpose according to its appropriateness to the time and context of its development.
- support students to develop understanding of characteristics of technological outcomes at level 5, teachers could:
  - provide students with opportunities to analyse examples of technological outcomes that have been evaluated as fit for purpose according to its appropriateness to the time and context of its development.
  - identify the negative impacts. Impacts may be in terms of people’s sensory perception and/or physical abilities.

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 technologies that have been evaluated as fit for purpose according to its appropriateness to the time and context of its development.
- support students to analyse the role codified technological knowledge plays in technological practice.

ACHIEVEMENT OBJECTIVES
To support students to develop understanding of characteristics of technology at level 4, teachers should:

- explain how interdisciplinary collaboration in socio-technological environments is complex and result in inextricable relationships between technological outcomes, artefacts and systems.
- 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. Lessons may be written or modify the technological outcome or retain the outcome with modified operational parameters. Operational parameters refer to the boundaries and conditions within which the outcome has been designated to function.

ACHIEVEMENT OBJECTIVES
To support students to develop understanding of characteristics of technology 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 categorization 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.

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

- explain the role codified knowledge plays in technological practice.
- provide students with opportunities to discuss examples of socio-technological environments to 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.

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

- explain the role codified knowledge plays in technological practice.
- provide students with opportunities to discuss examples of socio-technological environments to 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.

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

- explain how interdisciplinary collaboration in socio-technological environments is complex and result in inextricable relationships between technological outcomes, artefacts and systems.
- 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.

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

- explain the role codified knowledge plays in technological practice.
- provide students with opportunities to discuss examples of socio-technological environments to 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.
LEVEL SEVEN

Teachers should establish if students have developed robust level six understandings and are ready to begin working towards level seven achievement objectives for the nature of technology and plan learning experiences to progress these as guided by the level seven indicators below.

Characteristics of Technology

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 interweaving 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 recognize 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 technologies 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 particular 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 technologies take competing priorities into account during decision making. Competing priorities include such things as: innovation versus acceptance; 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 developments arise turn technology influences socio-cultural factors in complex and ongoing ways.

Characteristics of Technological Outcomes

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 aims of its development and to make informed judgments as to the outcome's fitness for purpose.

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.

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 environments they are used within.

INDICATORS

Students can:

- discuss the implications of viewing fitness for purpose in its broadest sense as related to the design and development, manufacture, evaluation and analysis of technological outcomes.

LEVEL EIGHT

Teachers should establish if students have developed robust level seven understandings and are ready to begin working towards level eight achievement objectives for the nature of technology and plan learning experiences to progress these as guided by the level eight indicators below.

Characteristics of Technology

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:

- 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 (eg, such things as the sustainability of resources used, ethical nature of testing practices, cultural appropriateness of framing practices, 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.

Characteristics of Technological Outcomes

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 (eg, such things as the sustainability of resources used, ethical nature of testing practices, cultural appropriateness of framing practices, determination of lifecycle and ultimate disposal).
- support students to critically analyse and justify the fitness for purpose, in its broadest sense on the manufacture of technological outcomes.
- support students to critically analyse and justify the fitness for purpose, in its broadest sense on the design and development of technological outcomes.

INDICATORS

Students can:

- 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.

INDICATORS

Students can:

- discuss the implications of viewing fitness for purpose in its broadest sense as related to the design and development, manufacture, evaluation and analysis of technological outcomes.
- discuss the implications of viewing fitness for purpose in its broadest sense as related to the design and development, manufacture, evaluation and analysis 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.

INDICATORS

Students can:

- discuss the implications of viewing fitness for purpose in its broadest sense as related to the design and development, manufacture, evaluation and analysis of technological outcomes.
- discuss the implications of viewing fitness for purpose in its broadest sense as related to the design and development, manufacture, evaluation and analysis 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.
TECHNOLOGICAL KNOWLEDGE: INDICATORS OF PROGRESSION

LEVEL ONE

TEACHER GUIDANCE
To support students to develop understanding of technological modelling at level 1, teachers could:

- provide students with the opportunity to discuss why technological modelling is important to the development of technological outcomes and that it involves designing and prototyping
- guide students to identify that functional models are representations of potential outcomes and that they exist in many forms (e.g., thinking, talking, drawing, physical models, multimedia presentations, etc)
- provide students with the opportunity to discuss that design concepts include design ideas for parts of an outcome, as well as the conceptual design for the outcome as a whole
- provide students with the opportunity to interact with a variety of functional models and guide them to identify that the purpose of functional modelling is to help design concepts to see if they are suitable for use in the development of an outcome
- guide students to identify that prototypes are the first versions of fully completed technological outcomes
- provide students with a range of prototyping examples and guide them to identify that the purpose of prototyping is to test the outcome
- provide students with the opportunity to explore a variety of prototyping examples and guide them to identify how the materials have been manipulated to make the product example, in a wooden toy the wood has been shaped, sanded and painted. In a sandwich, the bread dough has been shaped, cooked and combined with the fabric has been baked and sewn together.

INDICATORS
Students can:
- describe what a functional model is
- identify the purpose of functional modelling
- identify what a prototype is
- identify the purpose of prototyping
- identify the materials used in particular technological products
- identify the properties of materials used in particular technological products
- identify the performance properties of materials used in particular technological products
- identify the role of a 'black box' in technological systems
- describe how functional modelling and prototyping can be used to develop an understanding of the importance of both in technological development
- describe the opportunity to develop understanding of prototyping and guide them to identify the purpose of prototyping to test the outcome
- explain the modular principles of technological systems

LEVEL TWO

TEACHER GUIDANCE
To support students to develop understanding of technological modelling at level 2, teachers could:

- provide students with a range of technological products and guide them to identify that the purpose of functional modelling is to help design concepts to see if they are suitable for use in the development of an outcome
- provide students with the opportunity to explore a variety of functional models and guide them to identify that the purpose of functional modelling is to help design concepts to see if they are suitable for use in the development of an outcome
- guide students to identify that prototypes are the first versions of fully completed technological outcomes
- provide students with a range of prototyping examples and guide them to identify how the materials have been manipulated to make the product example, in a wooden toy the wood has been shaped, sanded and painted. In a sandwich, the bread dough has been shaped, cooked and combined with the fabric has been baked and sewn together.
- provide students with the opportunity to discuss why technological modelling is important to the development of technological outcomes and that it involves designing and prototyping
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INDICATORS
Students can:
- identify the role of a 'black box' in technological systems
- describe how functional modelling and prototyping can be used to develop an understanding of the importance of both in technological development
- describe the opportunity to develop understanding of prototyping and guide them to identify the purpose of prototyping to test the outcome
- explain the modular principles of technological systems

LEVEL THREE

TEACHER GUIDANCE
To support students to develop understanding of technological modelling at level 3, teachers could:

- provide students with the opportunity to discuss why technological modelling is important to the development of technological outcomes and that it involves designing and prototyping
- guide students to identify that functional models are representations of potential outcomes and that they exist in many forms (e.g., thinking, talking, drawing, physical models, multimedia presentations, etc)
- provide students with the opportunity to discuss that design concepts include design ideas for parts of an outcome, as well as the conceptual design for the outcome as a whole
- provide students with the opportunity to explore a variety of functional models and guide them to identify that the purpose of functional modelling is to help design concepts to see if they are suitable for use in the development of an outcome
- guide students to identify that prototypes are the first versions of fully completed technological outcomes
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INDICATORS
Students can:
- describe how functional modelling and prototyping can be used to develop an understanding of the importance of both in technological development
- describe the opportunity to develop understanding of prototyping and guide them to identify the purpose of prototyping to test the outcome
- explain the modular principles of technological systems
- describe the opportunity to develop understanding of prototyping and guide them to identify the purpose of prototyping to test the outcome
- explain the modular principles of technological systems
- describe the opportunity to develop understanding of prototyping and guide them to identify the purpose of prototyping to test the outcome
- explain the modular principles of technological systems

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TECHNICAL KNOWLEDGE: INDICATORS OF PROGRESSION

LEVEL FOUR

Students should establish if students have developed robust level four understandings and are ready to begin teaching towards level five achievement objectives for technological knowledge and plan learning experiences to progress these as guided by the level four indicators below.

**TEACHER GUIDANCE**

- **Students will understand** how materials are selected, manipulated, and transformed to achieve different purposes and outcomes.
- **Students can** explain the implications of for subsystems for the design, development, and maintenance of complex technological systems.

**LEVEL FIVE**

Students should establish if students have developed robust level five understandings and are ready to begin working towards level six achievement objectives for technological knowledge and plan learning experiences to progress these as guided by the level five indicators below.

**TEACHER GUIDANCE**

- **Students will understand** how materials are manipulated, transformed, and used to justify refinement of technological outcomes.
- **Students can** provide examples of functional and technical acceptability criteria.

**LEVEL SIX**

Students should establish if students have developed robust level six understandings and are ready to begin teaching towards level seven achievement objectives for technological knowledge and plan learning experiences to progress these as guided by the level six indicators below.

**TEACHER GUIDANCE**

- **Students will understand** how materials are selected, manipulated, and transformed to achieve different purposes and outcomes.
- **Students can** explain the implications of for subsystems for the design, development, and maintenance of complex technological systems.
## TECHNOLOGICAL KNOWLEDGE: INDICATORS OF PROGRESSION

### LEVEL SEVEN

**Teachers should establish if students have developed robust level 6 understandings and are ready to begin working towards level seven achievement objectives for technological knowledge and plan learning experiences to progress these as guided by the level seven Indicators below.**

<table>
<thead>
<tr>
<th>Technological Modelling</th>
<th>Technological Products</th>
<th>Technological Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ACHIEVEMENT OBJECTIVE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students will understand how the ‘should’ and ‘could’ decisions in technological modelling rely on an understanding of how evidence can change in value across contexts and how different tools are used to ascertain and mitigate risk.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TEACHER GUIDANCE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To support students to develop an understanding of technological modelling at level 7, teachers could:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• support students to explore how context impacts on the perception of the validity of evidence presented. Therefore, shifting from one context to another can change the status of the evidence provided by technological modelling.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• support students to explore how and why different people and communities accept different types of evidence as valid. That is, the status given to evidence is dependent on a range of factors including ethical views and the perceived authority of people involved in the presentation of the evidence.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• support students to understand how decisions underpinning technological modelling are based on what should and could happen, rely on an understanding of how evidence gained may differ in value across contexts and/or communities.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• support students to understand how technological modelling is used to ascertain and mitigate risk. Assessing risk involves establishing the probability of identified risks. Mitigation involves taking steps to reduce the probability of the risk being realised and/or the severity of the risk should it be realised.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• support students to analyse examples of technological modelling to understand how risk is ascertained and mitigated within particular technological developments.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• examples should include the modelling practices of technologists and should include instances where modelling was undertaken to mitigate risk.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### LEVEL EIGHT

**Teachers should establish if students have developed robust level 7 understandings and are ready to begin working towards level eight achievement objectives for technological knowledge and plan learning experiences to progress these as guided by the level eight Indicators below.**

<table>
<thead>
<tr>
<th>Technological Modelling</th>
<th>Technological Products</th>
<th>Technological Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ACHIEVEMENT OBJECTIVE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students will understand the role of technological modelling as a key part of technological development, justifying its importance on moral, ethical, sustainable, political, economic, and historical grounds.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TEACHER GUIDANCE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To support students to develop an understanding of technological modelling at level 8, teachers could:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• support students to develop a critical and informed understanding of why technological modelling is an important aspect for ensuring responsible and defensible decisions are made during the design, development and any subsequent manufacturing of technological outcomes.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• support students to critically analyse examples of technological modelling practices that were undertaken to address a range of competing and contestable factors to gain insight into how technological systems can be handled. These factors arise from such things as differing moral, ethical, cultural, and political views and the way in which people adhere to and develop different issues such as sustainability, globalisation, democracy, global warming etc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• examples should include the modelling practices of technologists and should include instances where modelling was undertaken to deal with competing and contestable factors.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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**INDICATORS**

**Students can:**

- discuss examples to illustrate why the status of evidence gained from technological modelling might change across contexts.
- explain why different people accept different types of evidence as valid and how this impacts on technological modelling.
- discuss the role of technological modelling in ascertaining and mitigating risk.
- describe students ability to illustrate the strengths and weaknesses of technological modelling for risk mitigation.

**INDICATORS**

**Students can:**

- discuss a range of subjective and objective evaluative procedures used to determine the suitability of materials and describe the underlying concepts and processes involved in particular materials.
- discuss examples of material evaluation procedures undertaken to support material selection decisions and justify the appropriateness of these procedures.
- discuss examples to explain how material evaluation impacted on design and development decisions.
- discuss examples to explain how material evaluation impacted on maintenance and disposal decisions.

**INDICATORS**

**Students can:**

- explain the concept of redundancy in relation to technological systems.
- discuss examples of particular technological systems to illustrate how factors related to redundancy impacted on system design, development, and/or maintenance decisions.
- explain the concept of reliability in relation to technological systems.
- discuss examples of particular technological systems to illustrate how factors related to reliability impacted on system design, development, and/or maintenance decisions.

**INDICATORS**

**Students can:**

- explain the roles of technological modelling in making informed, responsive and defensible design and development decisions.
- discuss the role of technological modelling in determining the suitability of new material developments and examine the underlying concepts and processes involved in particular design and development decisions.
- discuss examples of past material developments and explain how these impacted on product design, development, manufacturing, maintenance and disposal.
- discuss examples of current material developments and suggest probable implications for future technological product design, development, manufacturing, maintenance and disposal.