Department for Education

T Level Foundation Year Supporting progression to T Level

National technical outcomes

Engineering and manufacturing route

July 2023

Contents

Introduction

This document sets out national technical outcomes (NTOs) for the T Level Foundation Year (formerly the T Level Transition Programme), relevant to a particular T Level route. Delivery of the NTOs is expected as part of the programme, as set out in the Framework for Delivery and the NTOs will provide the basis for the content of T Level Foundation Qualifications that will be available from 2026. The T Level Foundation Year is a level 2 study programme to prepare young people for progression onto a T Level in a particular T Level route. There are NTOs for each T Level route.

Updating the national technical outcomes

We will review whether the NTOs need updating if and when there are any changes to T Levels or their content. As the NTOs are high level and relevant across a T Level route, we expect that they may need updating only where there are significant changes to T Level content. Should the NTOs need revising, we would expect AOs to review their qualification specification.

Who is this publication for?

This document is for anybody with an interest in the T Level Foundation Year national technical outcomes. This includes:

- Schools, colleges, training providers and their representative bodies
- Awarding organisations and their representative bodies
- Third sector and representative organisations
- Students, parents/guardians/carers
- Employers

Contact

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National technical outcomes explained

The NTOs provide students with an introductory foundation for any T Level in their chosen T Level route. They consist of a minimum of three outcomes that students are expected to be able to demonstrate by the end of the programme, and the knowledge and skills they will need to develop and apply to demonstrate the outcomes. The outcome-based structure of the NTOs is important to prepare students for the nature of T Levels.

The knowledge and skills within each outcome consist of topic areas and the underpinning content to be covered (the bullet points). They relate to the content of the T Levels in the route and are appropriate for level 2 study. Behaviours integral to achieving the outcome, and which can be explicitly assessed, are embedded into the skills. It is intended that students will typically acquire the knowledge and skills through realistic employment-related contexts and situations, and the outcomes are worded in a way that allows them to be applied in different contexts. Two routes – Agriculture, environmental and animal care and Health and science – include an outcome based on applying knowledge only.

Supplementary information is included for education providers to use, at their discretion, to support teaching and learning. For each outcome there is:

- an explanation for the combination of outcomes selected for the route
- the rationale for each outcome
- how the outcomes could be delivered in combination
- how to set the level of demand to meet students' development needs
- illustrative examples of how breadth and depth could be introduced into teaching and learning
- opportunities to support the contextualised development and application of English, maths and digital skills, and
- examples of behaviours that are integral to the outcome but not expected to be assessed explicitly.

The NTOs are intended to provide a minimum foundation for the T Level route, not competence in any occupation. They are designed to be taught within approximately 120-150 guided learning hours (GLH), with each outcome designed for approximately 30-50 GLH, based on the minimum level of knowledge and skills essential for demonstrating the outcomes. This allows education providers to add more breadth or depth, according to students' development needs, whilst ensuring there is sufficient time for the other components of the T Level Foundation Year.

A glossary of terms is provided in the Annex.

Information for awarding organisations

- Each T Level Foundation Qualification must be based on the NTOs for a single T Level route.
- Awarding organisations will be expected to adhere to the principles for developing the NTOs into qualification content.
- Awarding organisations may also refer to the supplementary information should they wish to do so, but this is not required.
- T Level Foundation Qualifications must focus on students' demonstration of the outcomes in the NTOs, through the application of relevant knowledge and skills. The outcomes are designed to be demonstrated independently or in combination.
- The outcomes are broad and applicable to different contexts but assessments could be set in a single context.
- In determining their assessment design, awarding organisations will need to refer to Ofqual's conditions, requirements and guidance for these qualifications.

Principles for developing the national technical outcomes into qualification content

Principle 1: Qualification content must include all the outcomes for the route and the specified knowledge and skills

This will ensure an overall level of consistency across different qualifications in the same route. Assessment must focus on the demonstration of these outcomes. The knowledge and skills topic area headings and the underpinning bullets reflect the minimum needed to demonstrate the outcomes, so this is expected to be included in the qualification content. All the optional content will need to be developed, where optionality between or within an outcome is specified in the NTOs for the route, and this optionality must be available to students taking the qualification.

Principle 2: Elaboration of the detailed qualification content must fit within the guideline size of 120 to 150 GLH for these qualifications, be relevant to demonstrating the outcomes and must not constrain skills development

The guideline size reflects that the NTOs were designed so that the minimum knowledge and skills required to demonstrate the outcomes can be taught within this range, excluding assessment time. The knowledge and skills within the NTOs are expressed in high-level terms so they will need to be elaborated on to develop the detailed content to be taught. Detailed content should not be included where it is not relevant to demonstrating the outcome. Skills development takes time and is an important part of the NTOs as preparation for T Levels, so this should be allowed for when determining the detailed qualification content.

Principle 3: Additional content may be proposed but we would expect this to be minimal; it must be relevant to demonstrating the outcome and fit within the size guideline

The rationale for proposing to include any additional content, above the minimum content set out in the NTOs, must be clear. Any extra content that is proposed should ensure the qualification size still fits within the size guideline for these qualifications and it does not change the nature of the outcome. Additional skills content, particularly transferable skills, should be prioritised over proposing extra knowledge content, as skills development is important preparation for T Levels. No additional outcomes may be introduced.

National technical outcomes: Engineering and manufacturing route

All students are to develop the knowledge and skills to be able to demonstrate the following three outcomes, by the end of the programme:

Outcome 1 (O1). Develop ideas for engineering products to meet specifications
Outcome 2 (O2). Produce sustainable engineered products
Outcome 3 (O3). Solve sustainability problems with innovative engineering ideas

Introductory rationale

Preparing for progression to T Levels in the Engineering and manufacturing route

These national technical outcomes are designed to support progression to either the Engineering and Manufacturing Design and Development T Level, or the Maintenance, Installation and Repair for Engineering and Manufacturing T Level, or the Engineering, Manufacturing Processing and Control T Level (all introduced from September 2022).

The outcomes introduce theories, concepts and principles that are relevant to the core content of all three T Levels in the Engineering and manufacturing route. This includes technical knowledge of engineering principles in relation to energy and mechanics, as well as knowledge related to materials and engineering processes.

The outcomes will provide opportunities for students to learn about different occupations within the engineering and manufacturing sector. For example, when learning about different engineering processes such as shaping and manipulation or joining and assembly, the application of these processes across the sector and how they are used in different occupations should be explained to students.

The outcomes also allow for technical skills development related to all three T Levels in the Engineering and manufacturing route, such as health and safety, preparing environments and marking out. The technical skills in a range of engineering processes, such as removing materials, shaping and manipulating and joining and assembly, are skills which are required across the engineering and manufacturing sector. As a result, they provide a foundation which supports the content of all occupational specialisms within the three T Levels in the Engineering and manufacturing route. This will support students to make informed choices about their next step and which T Level is most appropriate for their career aspirations.

Setting the level to meet individual student needs

For level 2, the products which students develop ideas for, the products they produce and the sustainability problems they solve will be relatively straightforward and routine, set in contexts that will be familiar to students.

For example, the specification may require students to develop ideas related to a security device in a familiar context such as for a garden shed, a vehicle or personal alarm. Alternatively, it could be a device for a specific use, such as one that would allow a mobile phone to be attached to a cycle.

Providers may want to introduce stretch and challenge for students by, for example, requiring more features to be introduced into a design solution or producing an engineered product which is more complex, with multi-step processes required.

Holistic delivery of outcomes

The three outcomes can be delivered independently of each other, with each focussed on different situations and contexts. This will allow students to explore different contexts and types of engineered products and solutions. It also supports students to develop ideas for a product that is ambitious and aspirational, but then does not have to be the product which they produce for outcome 2.

The outcomes can also be delivered together, in combination. For example, having developed ideas for an engineering product (O1) students could then apply their practical skills to produce this product (O2). This product could then relate to larger sustainability problems which students could solve with innovative engineering ideas (O3). An example context could be designing a piece of solar powered camping equipment, this could then be produced and the ideas in outcome 3 would relate to how a campsite could use innovative engineering ideas to improve sustainability.

Outcome 1: Develop ideas for engineered products to meet specifications

Rationale

This outcome focuses on developing ideas for engineering products in order to meet the requirements of given specifications. This emphasises how, across engineering occupations, there is a need to meet requirements set by clients, whether these are individuals or organisations, and to be able to produce technical drawings to convey these ideas.

The outcome provides an opportunity to develop technical knowledge in relation to engineering principles, engineering processes and engineering materials, all of which underpin design decisions. This technical knowledge is based on knowledge in the core content of all three Engineering and manufacturing T levels. This knowledge will then by applied to the design process to enable students to design products that are functional and meet any other requirements of a given specification, such as cost or aesthetics.

The outcome provides an opportunity to develop the transferable skills of analysing and creativity, when considering design. These transferrable skills will support students' progression to level 3 study and beyond.

Students are expected to develop ideas for the product and produce technical drawings to communicate their design ideas. This should include the use of computer-aided design (CAD). These skills will be developed in context, through the application of communication and digital skills.

Knowledge in relation to maths and the development of numeracy skills will also be required in order to produce technical drawings.

Knowledge

Engineering principles

- Energy: forms, difference between potential and kinetic and conversion
- Mechanical: power, work and efficiency, velocity and acceleration, units and measurement

Engineering processes

- Processes: characteristics, applications, benefits, and limitations

Materials

- Materials used in engineering: types, mechanical, electrical and chemical properties and suitability for different processes and applications
- Factors affecting choice of materials: cost, availability and form

Information and data

- Sources of data and information used to produce design solutions: purpose, typical content, format, terminology, and differences between sources of data and information
- Types of information and data created and recorded when designing engineered products
- Factors to consider when using information and data: confidentiality, privacy, intellectual property, and security

Communication

- Sketching techniques: different types, their purpose, and application for presenting design ideas to others
- Engineering technical drawings: types, principles, terminology and conventions
- Principles of effective communication: two-way process (send and receive messages), methods (verbal, non-verbal), styles (formal, informal), conventions of different types of written communication and suitability for different purposes and audiences
- Reading: principles, reading for comprehension, identifying salient points, summarising key points and synthesising information from different sources
- Spelling, punctuation and grammar (SPAG): punctuation markers, grammatical conventions and spelling of key technical and non-technical terminology
- Vocabulary: technical and non-technical and use to achieve particular effects and for different purposes

Numeracy

- Trigonometry: principles, trigonometric functions and use of trigonometry to determine dimensions in 2D and 3D
- Geometry: principles, properties of geometric points, lines and angels, Pythagoras' theorem, and scale factors

Digital

- Computer-aided design (CAD): principles, features, conventions and applications
- Software: features, functions and applications to create computer aided designs
- Management of digital information and data: classification and organisation, naming conventions, storage systems and protection methods, accessibility and formats
- Protection of personal/organisational/client data: legal framework, risks, software and procedures

Skills

Analysing

- Identify common features in information
- Organise common features into types
- Discern patterns in information
- Deconstruct information

Creativity skills

- Lateral thinking to consider opportunities from different perspectives
- Make novel connections between ideas
- Recognise ideas, alternatives, and possibilities
- Form ideas iteratively

Communicating

- Synthesise information and data from different sources
- Summarise information and data
- Apply technical language in relevant contexts
- Apply written communication techniques to produce formal reports following standard conventions
- Apply written communication skills to clearly articulate a message
- Create documents appropriate to purpose and audience
- Sketch 2D and 3D designs
- Interpret information and data presented in different formats

Numeracy skills

- Substitute numerical values into formulae and expressions
- Apply scale factors and scale diagrams to engineering designs
- Use trigonometry and geometry to create 2D and 3D representations
- Apply the properties of angles at a point

Digital skills

- Organise digital information
- Store digital information securely
- Retrieve digital information
- Apply software functions to produce computer aided designs

Supplementary information to support teaching and learning

Illustrative examples: Develop breadth through:

Materials

- Types of materials: ferrous metals, non-ferrous metals and polymers
- Properties of materials:
    - Mechanical: tensile strength, sheer strength, compressive strength, malleability/ductility and hardness
    - Electrical: conductivity and electrical resistance
    - Chemical: resistance to corrosion

Information and data

- Sources of information used to produce design solutions: client requirements in relation to function, performance, cost and aesthetics

Communication

- Types of technical drawings: isometric, orthographic, schematic diagrams and working drawings

Digital

- Computer-aided design (CAD) software: principles: annotations, and symbols

Illustrative examples: Develop depth for stretch and challenge through:

- Range of features incorporated into computer aided designs when designing engineering solutions
- How the properties of materials contribute to product performance and suitability when designing engineering solutions
- Incorporating planned obsolescence when designing engineering solutions
- Incorporate the principles of the 6R's (Rethink, Refuse, Reduce, Reuse, Recycle, and Repair) when designing engineering solutions

Behaviours:

- Empathetic
- Integrity

Mapping of opportunities to support students' development of English, maths and digital skills:

English

- GCSE Critical reading and comprehension
    - Synthesise information and data from different sources
    - Interpret information and data presented in different formats
- GCSE: Writing
    - Apply written communication skills to clearly articulate a message
    - Produce clear, coherent technical drawings
- Functional skills: Reading
    - Interpret information and data presented in different formats
    - Summarise information and data
- Functional skills: Writing
    - Apply written communication skills to clearly articulate a message
    - Produce clear, coherent texts
    - Apply appropriate vocabulary, grammar, form, structural and organisational features to reflect audience, purpose and context

Maths

- GCSE: Algebra
    - Substitute numerical values into formulae and expressions
- GCSE: Ratio, proportion and rates of change
    - Apply scale factors and scale diagrams to engineering designs
- GCSE: Geometry and measures
    - Use principles to create 2D and 3D representations
    - Apply the properties of angles at a point
- Functional skills: Measures, shape and space
    - Use principles of geometry to create 2D and 3D representations
    - Apply the properties of angles at a point

Digital

- Functional skills: Using devices and handling information
    - Organise digital information
    - Store digital information securely
    - Retrieve digital information
- Functional skills: Creating and editing
    - Apply software functions to produce computer aided designs

Outcome 2: Produce sustainable engineered

Rationale

This outcome focuses on technical, practical, hands-on engineering skills and their application to produce a sustainable engineered product. The technical skills are relevant to a range of occupations related to all three of the T Levels in the Engineering and manufacturing route. Students will have the opportunity to apply technical knowledge of engineering processes through practical application which will be motivating and engaging and support progression to all three T Levels in the route. This outcome will also provide an opportunity to identify potential challenges students may encounter with the practical aspects of the T Level occupational specialisms.

Although the focus of this outcome is on technical skills development, it also provides an opportunity for students to learn about concepts related to engineering processes, health and safety, tools and equipment and use of materials in contexts that relate directly to the practical tasks that they will be completing.

In addition to the technical engineering skills, the content of this outcome also allows for the development of transferable planning skills, which can be useful not just when working on practical activities, but also when students are planning their own work and studies.

Students will need to read and interpret technical information, including technical drawings, and this is reflected in the communication skills.

It will also be important for students to consider resource requirements when producing engineered products, so numeracy knowledge and skills to calculate these requirements are included in this outcome.

Knowledge

Engineering processes

- Marking out: principles, conventions, processes and tools
- Processes: procedures and tools and equipment required

Health and safety

- Typical health and safety hazards that individuals can create and encounter when producing engineered products
- Likelihood and severity of health and safety risks associated with typical hazards
- Risk assessment: purpose, use and content
- Controls used to minimise risks

- Techniques used to support healthy and safe working practices, including manual handling

Tools and Equipment

- Tools: characteristics, purpose, safety, security, storage, maintenance, operation of hand-held and power tools used produce engineered products
- Equipment: characteristics, purpose, safety, security, storage and maintenance and operation of different types of equipment used to apply practical skills to produce engineered products

Materials, products, and consumables

- Materials, products and consumables: characteristics, purpose, applications and quantities of different types used when producing engineered products
- Material quantities required to ensure minimum wastage
- Factors affecting choice of materials: sustainability, cost, availability, durability, form, and suitability for purpose

Quality

- Quality: concept of quality, principles, difference between quality control and quality assurance, standards and application to the production of engineered products

Sustainability

- Sustainability implications for use of different materials in construction projects
- Waste management: principles, techniques (refuse, reduce, reuse, repurpose, recycle) and procedures in place within the sector to manage waste

People

- Professional behaviours: definitions and how behaviours are demonstrated in a practical engineering environment

Information and data

- Technical drawings: different types and their purpose and conventions
- Sources of information required to produce engineered products: purpose, format, terminology and typical content

Numeracy

- Numbers and the number system: techniques for the application of the four operations (addition, division, multiplication, subtraction)

Communication

- Reading: principles, reading for comprehension, identifying salient points, summarising key points and synthesising information from different sources

Skills

Technical engineering skills

- Prepare environments
- Mark out required measurements
- Remove materials
- Shape and manipulate materials
- Join and assemble materials
- Apply chemical and heat treatments to materials
- Surface finish materials
- Minimise waste

Health and safety skills

- Assess a situation for potential adverse effects
- Assess an area for potential health and safety risks
- Establish a safe working area
- Apply Personal Protective Equipment (PPE) appropriately following agreed procedures
- Apply manual handling techniques when lifting, carrying, handling and moving materials, equipment and tools as appropriate

Use of tools and equipment

- Apply techniques to effectively use tools to meet requirements of a task and situation
- Apply techniques to effectively use equipment to meet requirements of a task and situation

Sustainability skills

- Use materials sustainably when producing an engineered product
- Dispose of waste sustainably
- Minimise waste

Planning

- Identify discrete steps required to achieve an outcome, with attention to detail
- Estimate time and resources required to achieve an outcome
- Prioritise activities required to achieve an outcome
- Sequence activities required to achieve an outcome

Physical dexterity skills

- Apply precise and controlled movements when using tools, equipment and materials to produce engineered products

Self-managing

- Monitor own performance against objectives
- Manage own time in achieving objectives
- Move within an environment demonstrating situational awareness

Self-reflecting

- Identify success criteria for a task
- Consider process and evidence available for review
- Situational awareness
- Make judgements based on evidence available

Communicating

- Interpret information and data presented in different formats

Numeracy skills

- Calculate resource requirements to produce engineered products

Supplementary information to support teaching and learning

Illustrative examples: Develop breadth through:

Engineering processes

- Material removal (cutting, turning, milling and drilling)
- Shaping and manipulation (bending, folding, press forming, punching and stamping)
- Joining and assembling (rivets, threaded fastening, soldering, brazing and welding)
- Heat and chemical treatment
- Surface finishing

Health and safety

- Health and safety hazards: sharp objects and broken tools and equipment
- Health and safety risks slips, trips and falls
- Controls: inspection of equipment, housekeeping and Personal Protective Equipment (PPE)

Illustrative examples: Develop depth for stretch and challenge through:

- Type of products produced: more complex and multi-step processes required
- Factors that can impact on successful completion and quality of an engineered product, quality of drawings provided for the production process, including those with missing information and data

Behaviours:

- Resilience
- Self-confidence

Mapping of opportunities to support students' development of English, maths and digital skills:

English

- GCSE: Critical reading and comprehension
    - Synthesise information and data from different sources
    - Summarise information and data
    - Interpret information presented in different formats
- Functional skills: Reading
    - Synthesise information and data from different sources
    - Summarise information and data
    - Interpret information presented in different formats

Maths

- GCSE: Number
    - Calculate resource requirements to produce engineered products
- GCSE: Algebra
    - Calculate resource requirements to produce engineered products
- GCSE: Ratio, proportion and rates of change
    - Calculate resource requirements to produce engineered products
- GCSE: Geometry and measures
    - Calculate resource requirements to produce engineered products
- Functional skills: Using numbers and the number system
    - Calculate resource requirements to produce engineered products
- Functional skills: Measures, shape and space
    - Calculate resource requirements to produce engineered products
- Functional skills: Solving mathematical problems and decision making
    - Calculate resource requirements to produce engineered products

Outcome 3: Solve sustainability problems with innovative engineering ideas

Rationale

This outcome focuses on problem solving through investigation in the context of sustainability, a concept of significant importance to the engineering sector nationally and of interest to young people.

The technical knowledge content of this outcome sets the scene in terms of the use of high performance and smart materials in engineering and engineering technologies and processes that could be used to solve sustainability problems. Across the occupational specialisms of the T Levels in Engineering and manufacturing, the concepts of sustainability and the use of innovative materials and technologies are embedded.

In order to solve problems, students will need to develop transferable skills of investigating and creativity and critical thinking skills. This will help them evaluate information and then view solutions from different perspectives, considering alternatives to be able to propose innovative ideas.

Students will carry out investigations where they will encounter written information to read and interpret. The development of written communication skills will therefore be through their note taking and synthesis of information obtained.

The written communication theme is further developed through the production of clear and coherent documentation of their ideas in written format making use of digital technology.

It is envisaged that students will interact with ‘clients’ or ‘stakeholders’ to present their innovative engineering ideas. This could be by presenting their ideas to employer representatives or non-familiar individuals who are role playing a group of employers. This is reflected in the communication skills included in the content, which include oral communication (speaking and listening).

Knowledge

Materials used to solve sustainability problems

- High-performance materials, characteristics, properties, and applications
- Smart materials: characteristics, properties, and applications

Technologies and processes used to solve sustainability problems

- Technology: characteristics and applications
- Processes: characteristics and applications

Sustainability

- The concept of climate change and scientific views on causes and impacts
- Technological developments and their contribution to sustainability and business contexts
- Waste management: principles, techniques (refuse, reduce, reuse, repurpose, recycle), procedures and impact on engineering solutions
- Sustainability targets and related actions, restrictions and permission
- Sustainable materials: characteristics, purpose, applications and impact on engineering solutions

Investigation

- Data collection: methods, purpose, suitability and types of data
- Validity of information and data: accuracy, reliability, currency and bias
- Referencing of sources: techniques used to reference sources directly, paraphrasing and different types of sources

Problem solving

- Techniques, processes and strategies used to solve problems

Communication

- Principles of effective oral communication: two-way process (send and receive messages), methods (verbal, non-verbal) and styles (formal, informal)
- Reading: principles, reading for comprehension, identifying salient points, summarising key points and synthesising information from different sources
- Spelling, punctuation and grammar (SPAG): punctuation markers, grammatical conventions and spelling of key technical and non-technical terminology
- Vocabulary: technical and non-technical and use to achieve particular effects and for different purposes
- Listening techniques: active and deep
- Non-verbal communication: meaning of different types of body language, types and value of images and support materials as visual aids and impact of non-verbal communication to support comprehension of key messages
- Oral communication: pitch, tone and intonation and their impact on how a message is received
- Positive communication: techniques and their application to presenting ideas
- Engaging with an audience: techniques for establishing rapport, in conversation, in discussion, in debate, obtaining and clarifying information and presenting ideas

Digital

- Software: feature, functions and applications to present ideas
- Management of digital information and data: classification and organisation, naming conventions, storage systems, protection methods, accessibility and formats
- Online/Internet searches: techniques used to carry out and refine searches, Search Engine Optimisation (SEO) and its implication for search results
- Protection of personal data: risks, software and procedures

Skills

Investigating

- Develop search criteria and queries to support an investigation
- Identify sources of information and data required for an investigation
- Reference sources of information
- Interrogate information and data for validity

Critical thinking

- Effective questioning to elicit information
- Evaluating pros and cons of information provided
- Review information from different perspectives
- Apply logic and reasoned argument to information presented
- Synthesise information from different sources
- Draw evidence-based conclusions

Creativity skills

- Lateral thinking to consider opportunities from different perspectives
- Make novel connections between ideas
- Recognise ideas, alternatives and possibilities
- Form ideas iteratively

Communicating

- Synthesise information and data from different sources
- Engage an audience
- Summarise information and data with attention to detail
- Apply technical language in relevant contexts
- Apply active listening techniques when presenting ideas

- Apply oral communication skills to clearly articulate a message with attention to detail
- Apply written communication skills to clearly articulate a message
- Apply non-verbal communication techniques to support communication
- Create documents appropriate to purpose and audience
- Write for impact
- Engage in discussion, debate and conversation, listening to and responding to questions and feedback
- Show respect for others' views and opinions
- Apply communication techniques to secure audience understanding
- Interpret information and data presented in different formats
- Apply appropriate vocabulary, grammar, form, structural and organisational features to reflect audience, purpose and context

Digital skills

- Organise digital information
- Store digital information securely
- Retrieve digital information
- Apply software functions to present ideas

Supplementary information to support teaching and learning

Illustrative examples: Develop breadth through:

Technology and processes used to solve sustainability problems

- Technologies: 3D printing, surface nanotechnology, optical fibres, robotics and automation
- Processes: powder metallurgy, powder mixing/blending, pressing, compacting and sintering

Illustrative examples: Develop depth for stretch and challenge through:

- Complexity of sustainability problems
- The impact that factors such as relevance, validity, reliability, bias and currency have on information and data used to solve sustainability problems.
- Using teamwork in a virtual environment to solve sustainability problems
- Complexity of the information and data that is used from different sources to solve sustainability issues

Behaviours:

- Perceptive
- Focussed

Mapping of opportunities to support students' development of English, maths

English

- GCSE: Critical reading and comprehension
    - Synthesise information and data from different sources
- GCSE: Writing
    - Apply written communication skills to clearly articulate a message
    - Produce clear, coherent texts
    - Apply appropriate vocabulary, grammar, form, structural and organisational features to reflect audience, purpose and context
- GCSE: Spoken language
    - Apply communication techniques to secure audience understanding
    - Apply technical language in relevant contexts
    - Apply oral communication skills to clearly articulate a message
    - Engage in discussion listening to and responding to questions and feedback
    - Apply non-verbal communication techniques to support communication of key messages
- Functional skills: Reading
    - Interpret planning information and data presented in different formats
    - Summarise information and data
- Functional skills: Writing
    - Apply written communication skills to clearly articulate a message
    - Produce clear, coherent texts
    - Apply appropriate vocabulary, grammar, form, structural and organisational features to reflect audience, purpose and context
- Functional skills: Speaking, listening and communication
    - Apply communication techniques to secure audience understanding
    - Apply technical language in relevant contexts
    - Apply oral communication skills to clearly articulate a message
    - Engage in discussion listening to and responding to questions and feedback
    - Apply non-verbal communication techniques to support communication

Digital

- Functional skills: Using devices and handling information
    - Organise digital information
    - Store digital information securely
    - Retrieve digital information
- Functional skills: Creating and editing
    - Apply software functions to present ideas
    - Apply advanced software functions to present ideas

Annex: Glossary

Term	Description
Behaviours	The behaviours included are enabling attributes and attitudes identified by employers as important to industry and to achieving the outcomes. They are taken from the list developed for T Levels, available from the Operating Instructions for the Creation of Outline Content Annex E. Most of the behaviours have been included as supplementary information for providers in designing teaching and learning. Those that can be assessed in context have been incorporated into the skills to be assessed. These are: “self-reflecting” and “self-managing”.
Content	The national technical outcomes set out at a high level, the minimum content needed to demonstrate the outcomes for the specified route. The content includes the outcomes, all knowledge and skills topic area headings and the underpinning bullets.
English, maths and digital	There are English (communication), maths (numeracy) and digital topic areas in the knowledge and skills where they are required to achieve the outcome and must be covered in the qualification. Supplementary information provides mapping and references to relevant English, maths and digital qualification subject content. This is to support naturally occurring opportunities for these skills to be developed and applied in context, to help consolidate students’ learning and understand their relevance and value to industry. The mapping references relate to qualification subject content from: • GCSE English language • GCSE mathematics • Functional Skills English • Functional Skills mathematics • Functional Skills Qualifications - digital subject content
Holistic delivery	Holistic delivery involves integrated learning so that students make connections between skills, knowledge and understanding from across the programme.
Illustrative examples of breadth and depth	Illustrative examples of how breadth and depth could be introduced into teaching and learning. Developing breadth – supports the consolidation of knowledge and skills at the same level, by applying concepts, facts and theories to different contexts. Developing depth – provides stretch and challenge to move students towards the next level, by analysing information and ideas from across the contexts, to draw conclusions and make judgements.

Term	Description
Knowledge and understanding	The knowledge content included in each outcome includes both knowledge and understanding, which relate to the theoretical facts, principles, concepts, procedures and techniques that students should acquire.
Outcomes	The national technical outcomes describe what the student should be able to do by the end of the programme. They encompass: • the activities that students will undertake to demonstrate their learning • the content (knowledge and skills) being taught and learnt • the knowledge, skills and behaviours being developed in students. Most outcomes include both knowledge and skills. The Agriculture, environmental and animal care and Health and science routes include an outcome with knowledge only.
Rationale	This is the reasoning for the content. There is an introductory rationale for each set of national technical outcomes and a rationale for each outcome.
Route	The Sainsbury Review set out 15 routes structuring occupations across the labour market that require technical education. There are T Levels for 12 Technical Education routes.
Route-based approach	There is one set of national technical outcomes for each of the 12 T Level routes, rather than each T Level or occupational specialism. This is to enable progression to any T Level within the route.
Route-based project	T Level Foundation Year students are expected to complete a small project relevant to their route. A resource is available to help education providers design and deliver effective route-based projects.
Skills	There are different types of skills included in the national technical outcomes: • Technical skills – which are occupation-specific, mostly practical skills. These may vary widely between industry, sector, occupation and job type. • Employability or transferable skills – which correspond to those developed for T Levels, examples of which are available from the Operating Instructions for the Creation of Outline Content Annex E. Also included are English, maths and digital skills which appear under Communication, Numeracy and Digital headings.
Topic areas	The topic areas are the headings which set out, at a high level, the underpinning key knowledge and skills areas required to demonstrate the outcome.

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