Department for Education

T Level Foundation Year Supporting progression to T Level

National technical outcomes

Health and science 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

There is no change to the NTOs for the Health and Science route, resulting from the revised Health T Level for teaching from September 2023. The NTOs are route level, not T Level or occupation specific, the science content has been carefully considered to support the development of general science knowledge of all learners and enable progression to all three Health, Science or Healthcare Science T Levels.

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

For enquiries about this document, please email the team at TLevelTransition.PROGRAMME@education.gov.uk

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: Health and science 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). Apply knowledge and understanding of scientific theories, concepts and principles to health and science contexts
Outcome 2A (O2A). Provide person centred care to support the health and wellbeing of individuals OR
Outcome 2B (O2B). Follow Standard Operating Procedures to perform laboratory analysis
Outcome 3 (O3). Analyse information and data to highlight health and science issues

Introductory rationale

Preparing for progression to T Levels in the Health and science route

These national technical outcomes are designed to support progression to either the Health T Level, or Healthcare science T Level, or Science T Level (all introduced from 2021).

The outcomes introduce theories, concepts and principles that are relevant to the core of all three T Levels within the route. They also allow for technical skills development related to either the Health or Healthcare science T Levels, such as providing person centred care, or skills related to the Science T Level, such as laboratory analysis skills. There is also the opportunity to develop technical skills that apply across all three T Levels but in different contexts, such as health and safety and use of tools and equipment. As a result, they provide an insight into the content of all three T Levels, enabling students to make informed choices about their next step and which T Level is most appropriate for their needs and aspirations.

Outcome two provides a choice. Outcome 2A is focused on providing person centred care to support the wellbeing of individuals and is aimed at students intending to progress to the T Level in Health or T Level Healthcare science. Outcome 2B is focused on performing laboratory analysis and is aimed at students who are intending to progress onto the T Level in Science or T Level in Healthcare science. The technical knowledge in both outcomes is applied through practical activity.

The outcomes will provide opportunities for students to learn about different occupations within the route. For example, when learning about supporting the health and wellbeing of individuals, students could be introduced to roles such as nurses, midwives, mental health professionals and therapists. This links with the occupational specialisms of the T Level in Health.

Similarly, when learning about the different types of laboratory analysis techniques, students could be introduced to occupations such as pharmacy technicians, healthcare scientists, laboratory technicians and food scientists. This links with the occupational specialisms of the T Level in Healthcare science and T Level in Science.

There are opportunities for students to be introduced to the roles and responsibilities of these different occupations and the entry and progression pathways within those occupations. This will enable 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 technical skills which students demonstrate and the information and data which they will investigate, will be relatively straightforward, routine and familiar to students. For example, students would provide person centred care to individuals with uncomplex needs and laboratory analysis will use routine analysis techniques.

Providers may want to introduce stretch and challenge for students by introducing contexts that are more complex and unfamiliar. For example, providing person centred care to individuals with more complex needs or performing laboratory analysis activities which are more complex and require multi-step processes.

Holistic delivery of outcomes

The three outcomes can be delivered independently of each other, with each focused on different contexts. Outcome one could be delivered as a ‘stand-alone’ outcome. The contexts for either outcomes 2A or 2B do not have to relate to the investigation carried out in outcome 3.

However, the outcomes can also be delivered together in combination. For example, having provided person centred care (O2A) students could then analyse data relevant to individuals they provided care for (O3). An example context could be providing person centred care for an individual with diabetes and analysing information and data on the changes in the treatment for diabetes over the past twenty years.

Outcome 1: Apply knowledge and understanding of scientific theories, concepts and principles to health and science contexts

Rationale

This outcome focuses on knowledge and does not include skills or behaviours.

It focuses on underpinning scientific knowledge which is fundamental to understanding a range of health, healthcare science and science contexts.

The outcome introduces theories, concepts and principles that are relevant to the core content of all the three T Levels in the Health and science route. This outcome includes fundamental knowledge of cells, microbiology, particles, acid and bases, waves and ionising radiation. This knowledge is important in all occupations covered by the three T Levels in the Health and science route such as laboratory technician, pharmacy technician or nursing.

The outcome is structured into topic areas and each topic area relates to a scientific concept. It is important that students are not only supported to develop knowledge and understanding of the concepts, but also to apply them to contexts within the health, healthcare science and science sectors. For example, students could learn how the scientific concept of waves is applied to medical diagnosis and treatment of patients using magnetic resonance imaging (MRI) or ultrasound images as the context.

Although some of this scientific knowledge is covered at Key Stages 3 and 4, students may have misconceptions and gaps in their knowledge related to these topics, which may hinder them when they progress to the T Levels in the Health and science route.

Knowledge

Cells

- Components in animal cells: structure, function and relationship between these
- Transport of substances in and out of cells: types of substances transported, processes for transport, similarities and differences of these processes
- Specialised cells: types, functions and adaptations for specific roles

Microbiology

- Microorganisms: types and characteristics
- Pathogens: definition, specific examples and the diseases they cause, transmission and how this spread can be reduced or prevented

Particles

- Particles: types of particles, states of matter and particle arrangement in different states of matter
- Particle movement: relationship between energy and movement in different states of matter and how temperature and pressure can affect energy of particles

Acids/Bases

- Acids, Alkalis, bases and neutral solutions: definitions and properties
- Indicators and pH scale, purpose, applications and ways to measure the acidity or alkalinity of a solution
- Neutralisation reactions: characteristics and uses

Waves

- Waves: types, characteristics and properties and transfer of energy
- Electromagnetic waves: types and applications

Ionising radiation

- Ionising radiation: types, properties, applications and concept of half-life
- Hazards of using ionising radiation: effects on the human body and protection measures required

Supplementary information to support teaching and learning

Illustrative examples: Develop breadth through:

- Components in animal cells: nucleus, cytoplasm, cell membrane, mitochondria and ribosomes
- Microorganisms: bacteria, fungi (yeast and moulds) and viruses
- Examples of pathogens and diseases they cause: Streptococcus pneumoniae and pneumonia, Norovirus and vomiting/diarrhoea, human immunodeficiency virus (HIV) and acquired immune deficiency syndrome (AIDS)
- Transmission of pathogens: direct contact, water, air, unhygienic food preparation and vector
- Processes for transport: diffusion, osmosis and active transport
- Changes in particle arrangement during chemical reactions
- Range of electromagnetic waves: radio waves, microwaves, infrared radiation, visible light, ultraviolet light, X-rays and Gamma rays

Illustrative examples: Develop depth for stretch and challenge through:

- Components of plant cells: nucleus, cytoplasm, cell membrane, mitochondria, ribosomes, vacuole, cell wall and chloroplast
- Similarities and differences between animal and plant cells
- Similarities and differences between different specialised cells
- How treatments for diseases caused by bacteria work
- How properties of waves affect their suitability for use within medical diagnosis and treatment
- How properties of ionising radiation affect its suitability for use within medical diagnosis and treatment

Outcomes 2A or 2B

Students are expected to complete either outcome 2A or outcome 2B, dependent on the T Level they are most likely to progress to.

Outcome 2: Provide person centred care to support the health and wellbeing of individuals

Rationale

This outcome focuses on providing person centred care, a fundamental concept for all occupations in the health and healthcare science sectors when working with individuals, patients and service users.

The outcome provides an opportunity to develop technical knowledge in relation to anatomy and physiological systems and how physiological measurements can support the health and wellbeing of individuals by assessing if results and observations are outside of normal parameters. There is also technical knowledge on person centred care, the types of personal care activities that are routinely provided and how this is provided in order to support health and wellbeing.

The technical knowledge in this outcome is based on knowledge in the core content and pathway content of the T levels in Health and Healthcare science. This technical knowledge is applied to enable students to provide person centred care to support the health and wellbeing of individuals, both through physiological measurement and through providing personal care. This practical application of technical knowledge will provide an insight for students into the type of practical activities and interactions they will be involved in within the health and healthcare science sectors.

This outcome will also provide an opportunity to identify potential challenges students may encounter with the practical aspects of the T Level occupational specialisms.

In addition to the technical and practical skills, the content of this outcome also allows for the development of the transferable skills of planning and observing, which will be useful not just when working on practical activities, but also when students are planning their own work and as they progress onto level 3 study.

Students will need to read and interpret information, including care plans and Standard Operating Procedures (SOPs), in order to provide person centred care and this is reflected in the communication skills.

When taking physiological measurements and when providing personal care, students will need numeracy knowledge and skills to correctly record and interpret measurements, and to measure out and document data related to personal care activities such as a patient's water intake.

Often there is a requirement for the use of digital technology in the recording of patient data and this is reflected in the need to develop digital skills that support this and to ensure that personal data is stored securely.

Students are expected to develop the skills for this outcome through role play situations, with individuals acting as ‘patients’, ‘service users’ and ‘carers’. Other students could take on these roles, but it would also be beneficial if individuals whom students are unfamiliar with, undertook these roles to support the development of skills, particularly communicating.

Knowledge

Anatomy and physiology

- Physiological systems including cardiovascular and respiratory: components, structure function and organisation
- Expected normal physiological parameters for blood pressure, pulse rate, temperature and respiratory rate
- Recognised indicators of good physical health

Health and wellbeing

- Physiological measurements including blood pressure, pulse rate, temperature and respiratory rate: purpose, step by step procedures as outlined in Standard Operating Procedures (SOPs)
- Personal care: types, purpose and step by step procedures

Person centred care

- Concept: care, compassion, communication, courage, commitment and competence (6C’s)
- Implementation of care, compassion, communication, courage, commitment and competence (6C’s): gaining consent, ensuring privacy and dignity, respecting individuals, follow duty of care and escalating concerns

Health and safety

- Typical health and safety hazards that individuals can create and encounter when providing person centred care
- Likelihood and severity of health and safety risks associated with typical hazards
- Risk assessment: purpose, use and content
- Controls used to minimise risks
- Organisational health and safety policies, their role in meeting legal requirements and typical employee responsibilities

- Cleaning procedures used to maintain safe and hygienic environments: ‘clean as you go’, pre-cleaning, sanitising, disinfecting, rinsing, drying and handwashing
- Techniques used to support healthy and safe working practices, including manual handling

Equipment

- Equipment used to take physiological measurements: characteristics, purpose, safety (including infection control), security, storage, maintenance, operation (including calibration) and applications
- Equipment used to provide personal care: characteristics, purpose, safety (including infection control), security, storage, maintenance, operation and applications

Materials, reagents, and consumables

- Materials, reagents and consumables: types, characteristics, purpose, applications and quantities required when taking physiological measurements and providing personal care
- Material, reagent and consumable quantities required to ensure minimum wastage

Sustainability

- Waste management: principles, techniques (refuse, reduce, reuse, repurpose, recycle), procedures and impact on materials, reagents and consumables used when providing person centred care
- Sustainable materials: characteristics, purpose and applications

Information and data

- Sources of data and information used when providing person centred care: purpose, typical content, format, terminology and differences between
- Types of information and data created when taking physiological measurements and providing personal care
- Factors to consider when using information and data: confidentiality, privacy, intellectual property and security

Communication

- 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, suitability for different purposes and audiences
- Reading: principles, reading for comprehension, identifying salient points, summarising key points and synthesising information from different sources
- 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 supporting health and wellbeing of individuals
- Engaging with an audience: techniques for establishing rapport, in conversation, in discussion, in debate, obtaining and clarifying information and presenting proposals

Numeracy

- Standard units of measurement: time, temperature, mass, weight, capacity and conversion between units
- Measurement: principles, standards, terminology and volume quantities

Digital

- Software: features, functions, applications for recording and presenting data and information in relation to an individual's health and wellbeing
- Management of digital information and data: classification and organisation, naming conventions, storage systems, protection methods, accessibility and formats

Skills

Provide person centred care

- Prepare self and environment
- Practice care, compassion, communication, courage, commitment and competence (6C's)
- Follow Standard Operating Procedures (SOPs) with attention to detail
- Take physiological measurements
- Provide personal care
- Record information

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, moving equipment or individuals
- Apply handwashing techniques
- Apply cleaning techniques

Use of equipment

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

Sustainability skills

- Use materials, consumables and reagents to minimise waste when providing person centred care
- Dispose of waste sustainably when providing person centred care

Planning

- Identify discrete steps required to achieve an outcome
- Estimate time and resources required to achieve an outcome
- Prioritise activities required to achieve an outcome
- Sequence activities required to achieve an outcome
- Coordinate activities required to achieve an outcome

Physical dexterity skills

- Apply precise and controlled movements when assisting with the health and wellbeing of an individual

Observing

- Identify relevant details of an individual to recognise issues with physical health

Communicating

- Synthesise information and data from different sources
- Engage an audience
- Summarise information and data
- Apply technical language in relevant contexts
- Apply active listening techniques to provide personal centred care
- Apply oral communication techniques to obtain and clarify information and data
- Apply oral communication skills to clearly articulate a message
- Apply non-verbal communication techniques to support communication
- Create documents appropriate to purpose and audience

- Engage in discussion/debate/conversation listening to and responding to questions and feedback
- Shows respect for others' views and opinions
- Apply an inclusive approach to engaging with others
- 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

Recording

- Transcribe information from one source to another
- Capture physiological measurement data and data related to personal care accurately

Numeracy skills

- Calculate resource requirements to provide person centred care
- Apply standard units of measure when taking physiological measurements and recording information and data related to providing personal care

Digital skills

- Organise digital information
- Store digital information securely
- Retrieve digital information
- Apply software functions to input and display data in relation to an individual's health and wellbeing

Supplementary information to support teaching and learning

Illustrative examples: Develop breadth through:

Anatomy and physiology

- Physiological systems: renal system and integumentary system
- Expected normal physiological parameters: respiratory volume, oxygen saturation level and Body mass index (BMI)
- Recognised indicators of good physical health: skin colour, skin condition, body language, mobility and reactions

Health and wellbeing

- Physiological measurement types: pulse oximetry, body mass index and respiratory volume (peak flow)
- Personal care types: apply or replace simple dressing, personal hygiene (washing, dressing, bathing, toileting), feeding and drinking and support with mobility (getting in or out of bed, bathing, sitting, standing, walking)

Equipment

- Equipment used to take physiological measurements: digital blood pressure monitor, thermometer, watch with second hand, pulse oximeter, weighing scales, tape measure and peak flow monitor
- Equipment used for personal care: wheelchairs, walking aids/frames hoists and slide sheets

Information and data

- Sources of data and information: care plans, Standard Operating Procedures (SOPs), equipment manuals
- Types of information and data created: physiological measurement results and observations, personal care data such as patient's daily water intake

Illustrative examples: Develop depth for stretch and challenge through:

- Taking account of situations which may affect the result of physiological measurements
- Extraneous factors that can affect the results obtained from physiological measurements, for example, 'white coat syndrome'
- Providing person centred care to individuals with complex needs

Behaviours:

- Professional
- Focussed

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: 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 information and data presented in different formats
    - Summarise information and data
- 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

Maths

- GCSE: Number
    - Apply the standard units of measure
- Functional skills: Using numbers and the number system
    - Apply standard units of measure

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 record information and data in relation to health and wellbeing of individuals

Outcome 2B: Follow Standard Operating Procedures to perform laboratory analysis

Rationale

This outcome focuses on technical hands-on analysis skills where students are required to follow Standard Operating Procedures (SOPs) to perform laboratory analysis activities within a scientific laboratory environment. The technical practical skills are relevant to occupations in both the T Level in Science and T Level in Healthcare science.

Students will have the opportunity to apply technical knowledge of laboratory analysis techniques through practical application, which will provide an insight into the typical laboratory analysis investigations that are routinely carried out and the requirements of working in a scientific laboratory environment. Students will develop knowledge and skills in the management and use of scientific equipment in order to perform laboratory analysis activities.

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 practical skills development, it provides an opportunity for students to learn about concepts related to health and safety, use of tools and equipment and use of materials in contexts that relate directly to the analysis tasks that they will be completing.

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

Students will need to read and interpret technical information, including Standard Operating Procedures (SOPs) and equipment instruction manuals, in order to carry out laboratory analysis activities and this is reflected in the communication skills.

When performing laboratory analysis activities, students will need numeracy knowledge and skills to correctly record measurements and to measure out materials, reagents and consumables correctly.

Often there is a requirement for the use of digital technology in the recording of results which result from laboratory analysis activities, and this is reflected in the need to develop digital skills that support this and to ensure that recorded data is stored securely.

Knowledge

Laboratory analysis techniques

- Techniques: types, purpose, suitability and application
- Procedure: steps and stages as outlined in Standard Operating Procedures (SOPs), time and resource requirements

Health and safety

- Typical health and safety hazards that individuals can create and encounter when performing laboratory analysis activities
- 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 and operation of different types of tools when performing laboratory analysis activities
- Equipment: characteristics, purpose, safety, security, storage, maintenance and operation of different types of equipment when performing laboratory analysis activities

Materials, consumables and reagents

- Materials, consumables and reagents: types, characteristics, purpose, applications and quantities required when performing laboratory analysis activities
- Materials, consumables and reagents: quantities required to ensure minimum wastage

Sustainability

- Waste management: principles, techniques (refuse, reduce, reuse, repurpose, recycle), procedures and impact on materials, reagents and consumables used when performing laboratory analysis activities
- Sustainable materials: characteristics, purpose and applications

People

- Professional behaviours: definitions, how behaviours are demonstrated in a scientific laboratory

Information and data

- Sources of information required when performing laboratory analysis activities: purpose, typical content, format and terminology

- Types of information and data created and recorded when performing laboratory analysis activities
- Factors to consider when using information and data: confidentiality, privacy, intellectual property and security
- Types of documents used to record primary data

Communication

- Principles of effective communication: 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

Numeracy

- Numbers and the number system: techniques for the application of the four operations (addition, division, multiplication, subtraction)
- Standard units of measurement: time, temperature, mass, weight, capacity and conversion between units
- Measurement: principles, standards, terminology and volume quantities

Digital

- Software: features, functions, applications for recording results from laboratory analysis
- Management of digital information and data: classification and organisation, naming conventions, storage systems, protection methods, accessibility and formats
- Protection of organisational and client data: legal framework, risks, software and procedures

Skills

Laboratory analysis skills

- Prepare environments
- Set up equipment
- Prepare sample to be analysed
- Analyse sample
- Record results

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 and equipment

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, consumables and reagents to minimise waste when performing laboratory analysis activities
- Dispose of waste sustainably when performing laboratory analysis activities

Planning

- Identify discrete steps required to achieve an outcome
- Estimate time and resources required to achieve an outcome
- Prioritise activities required to achieve an outcome
- Sequence activities required to achieve an outcome
- Coordinate activities required to achieve an outcome

Physical dexterity

- Apply precise and controlled movements when using equipment and materials

Observing

- Identify relevant details of a situation and an environment
- Monitor the environment for changes that may affect performing a laboratory analysis activity

Communicating

- Interpret information and data presented in different formats
- Apply written communication skills to create documents for different purposes with attention to detail
- Apply appropriate vocabulary and spelling to documents

Recording

- Transcribe information from one source to another
- Capture laboratory analysis results data accurately

Numeracy skills

- Calculate resource requirements to perform laboratory analysis activities

- Apply standard units of measure to perform laboratory analysis activities

Measuring

- Measure materials to required level of detail

Digital skills

- Organise digital information
- Store digital information securely
- Retrieve digital information
- Apply software functions to record results from laboratory analysis activities

Supplementary information to support teaching and learning

Illustrative examples: Develop breadth through:

Laboratory analysis techniques

- Types: simple tests, instrumental techniques and titration

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)

Information and data

- Sources of data and information: Standard Operating Procedures (SOPs) and equipment manuals
- Types of information and data created: laboratory analysis results and observations

Illustrative examples: Develop depth for stretch and challenge through:

- Take account of factors that may affect the result of laboratory analysis activities
- Relationship between results obtained outside of 'expected range' and possible sources of error in analysis techniques
- Use of more complex instrumentation to perform laboratory analysis activities

Behaviours:

- Focussed
- Independent
- Integrity

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

English

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

Maths

- GCSE: Number
    - Calculate resource requirements to perform laboratory analysis activities
    - Apply the standard units of measure to perform laboratory analysis activities
- Functional skills: Using numbers and the number system
    - Calculate resource requirements to perform laboratory analysis activities
    - Apply standard units of measure

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 record information and data from laboratory analysis activities

Outcome 3: Analyse information and data to highlight health and science issues

Rationale

This outcome focuses on research investigations to analyse information and data in the context of health and science. There is no technical knowledge for this outcome as the health and science information and data which students encounter provides the context. There is no expectation that students have technical knowledge in relation to the context of the investigation, although it should be appropriate for this level and be motivating for students. Being able to contribute to research within specific areas of health and science, working independently from sourced material and analysing information and data are core skills which students will need as they progress onto T Levels in the Health and science route and beyond in their careers.

This outcome provides the opportunity for students to develop the transferable skills of analysing, investigating and critical thinking in order to analyse information and data and to highlight issues. These are also skills which will all be valuable preparation for level 3 study.

Students will carry out research investigations where they will encounter written information and data to read and interpret. The development of written communication skills would therefore be through their note taking and synthesis of information and data obtained. The written communication theme is further developed through the production of clear and coherent documentation of the issues students identify, making use of digital technology.

As part of their investigations, students should have the opportunity to analyse data, using basic statistical techniques in order to be able to construct tables, charts and graphs to present information and data to highlight health and science issues. Numeracy skills are included as these will support students in their analysis and interpretation of data.

Digital skills are developed to support the presentation of data in graphical format, which will be enhanced through the development of communication skills.

It is anticipated that students will interact with ‘stakeholders’ to present the issues they have highlighted. This could be by presenting the issues to health panel representatives or non-familiar individuals who are role playing such a group. This is reflected in the communication skills included in the content, which include oral communication (speaking and listening).

Knowledge

Information and data

- Sources of data and information required to highlight issues: purpose, typical content, format, terminology and differences between
- Types of information and data created and recorded when highlighting issues
- Factors to consider when using information and data: confidentiality, privacy, intellectual property and security
- Types of documents used to record primary data
- Key elements of data: qualitative, quantitative, primary, secondary, discrete, continuous, structured and unstructured

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

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

Numeracy

- Data analysis: techniques used to identify patterns and variances, trends, correlation, causation, interpolation, extrapolation and predictions
- Descriptive statistics: purpose, suitability for different situations, techniques – frequency, central tendency (mean, median, mode) and variation (range)
- Data presentation: techniques and formats

Digital

- Software: feature, functions and applications to present highlighted issues
- 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

Skills

Analysing

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

Investigating

- Develop search criteria and queries to support an investigation to analyse data
- 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
- Draw evidence-based conclusions

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

Numeracy skills

- Construct tables, charts, graphs to present information and data
- Apply statistical techniques to analyse data

Digital skills

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

Supplementary information to support teaching and learning

Illustrative examples: Develop breadth through:

Information and data

- Sources of data and information: range of sources used

Investigation

- Data collection types: range of information and data collected including qualitative and quantitative

Illustrative examples: Develop depth for stretch and challenge through:

- Complexity of the information and data that is used from different sources to analyse
- Suitability of issues presented in relation to purposes and audience, for example, technical and non-technical audiences

Behaviours:

- Independent
- Perceptive
- Focussed
- Respectful

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

Maths

- GCSE: Statistics
    - interpret and construct tables, charts and diagrams
    - interpret, analyse and compare the distributions of data through appropriate measures of central tendency (median, mean, mode and modal)
- Functional skills: Handling information and data
    - Calculate the median and mode
    - Estimate the mean
    - Use the mean, median, mode and range to compare sets of data

Digital

- Functional skills: Using devices and handling information
    - Organise digital information
    - Store digital information securely
    - Retrieve digital information
    - Carry out and refine internet searches for information and data
- Functional skills: Creating and editing
    - Apply software functions to present highlighted issues
    - Apply advanced software functions to present highlighted issues

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.

Department for Education

About this publication:

enquiries www.education.gov.uk/contactus
download www.gov.uk/government/publications

Follow us on Twitter: @educationgovuk

Like us on Facebook: facebook.com/educationgovuk