Unit 24: Principles of Plant and Soil Science

Unit code: T/502/5688

QCF Level 3: BTEC National

Credit value: 10

Guided learning hours: 60

Aim and purpose

The aim of this unit is to provide learners with the principles of plant and soil science. It will enable learners to understand plant structures and physiology, and plant growth and development. It will enable them to investigate the principles of soil science, and to know ways in which people can influence plant and soil processes.

Unit introduction

All land-based sectors and many applied science industries are dependent, directly or indirectly, on plants and soil. Plants are dependent on a medium for providing essential elements for life such as nutrients and an anchorage. In most cases, this medium is soil.

Understanding plant and soil processes is essential for learners wishing to become involved in the land-based or applied science industries, particularly those enterprises which are primarily plant-focused. In this unit learners will develop an understanding of plant structures, important life processes such as photosynthesis and respiration, and plant life cycles. Basic soil science will also be studied, with the emphasis on relationships between soil, soil processes, plant development and nutrition.

Learners will explore the function of internal and external plant structures and their role in plant physiology. They will study the processes of photosynthesis and respiration. They will investigate plant structure and function in the context of the plants commonly used within the relevant land-based and/or applied science industries.

Learners will then look at how plants grow and develop. They will study plant life cycles and reproduction. They will then learn about the origins, nature, structure and function of soil, the different types of soil, their properties and the implications of these properties for plant growth. This will be linked to plant nutrition, and learners will consider the role of major and micronutrients in plant growth.

All importantly, learners will consider the human influences on plant and soil processes, such as deforestation and cultivation methods. These methods can be both beneficial and detrimental to plant and soil environments.

Learning outcomes

On completion of this unit a learner should:

1 Understand plant structures and physiology

2 Understand plant growth and development

3 Be able to investigate the principles of soil science

4 Know the ways in which people can influence plant and soil processes.

Unit content

1 Understand plant structures and physiology

Function of plant structures: external structures (roots, shoots, stem, leaves, buds, flowers, fruits, seeds); internal structures (cell structure, cytoplasm, organelles, parenchyma, collenchyma, sclerenchyma, xylem tissue, phloem tissue, cambium); specialised cells, tissues and organs (pericycle, endodermis, lenticels, cotyledons, stolons, rhizomes, storage organs); use of plants related to their structures

Photosynthesis: equation for photosynthesis; structure and function of chloroplasts; function of pigments, eg chlorophyll; factors influencing the rate of photosynthesis, eg temperature, humidity, light, position within the canopy, water availability; compensation points; manipulation of limiting factors to enhance plant performance, eg weed control, carbon dioxide enrichment, climate control, irrigation, drainage; genetic modification

Respiration: definition of aerobic and anaerobic respiration; equation for aerobic respiration; structure and function of mitochondria; factors influencing the rate of respiration, eg temperature, water availability, seasonal growth; manipulation of respiration, eg control in crop storage, controlled growing environments

Water uptake, movement and loss: osmosis; diffusion; plasmolysis; translocation; transpiration; factors influencing rates of uptake and loss, eg soil conditions, atmospheric and plant factors

2 Understand plant growth and development

Plant growth and development: life cycle types (ephemeral, annual, biennial, perennial); definition of monocotyledon and dicotyledon and examples of plant species in both; process and stages of germination; types of germination, eg epigeal, hypogeal; effects of photoperiod and temperature on reproductive growth; flower structures; pollination and fertilisation; seed production; fruit formation; dispersal; dormancy; asexual and vegetative reproduction; apical meristems; lateral meristems; cell division; cell expansion; formation of roots, shoots, buds, leaves and tillers; function of major plant nutrients and deficiency symptoms (nitrogen, phosphorus, potassium, magnesium, sulphur); function of minor nutrients and trace elements; deficiency symptoms of minor nutrients and trace elements, eg sodium, iron, manganese, zinc, copper, molybdenum, boron, cobalt; liming and the effects of pH; the influence of human manipulation and interference in any of these processes

3 Be able to investigate the principles of soil science

Soil science: soil constituents (organic and inorganic material, water and air); soil types (loams, clays, silts, sands, organic soils); other types of media, eg gels, nutrient solutions; soil formation (the relationship between soils and parent bedrock); properties of soil particles, eg clay, silt, sand; electrical charges; cation exchange capacity; water holding capacity and how human actions can alter this; aeration; stability; organic matter; pH; soil structure definition, eg crumb structure, aggregate sizes, plough pans, macropores, micropores; effects of soil structure on plants, eg rooting depth, availability of plant nutrients, drainage, waterlogging; the part played by soil fauna in maintaining 'healthy' soil; the benefits and problems created by cultivation methods such as ploughing or cropping; human practices in use and management of soils that are more or less sustainable

4 Know the ways in which people can influence plant and soil processes

Human influences: impact of deforestation and land clearance upon plant communities and soil formation processes, eg infiltration and moisture retention, nutrient flow and nutrient cycle, soil stability, soil fauna, surface run off and erosion potential; the impact of different cultivation methods on soil horizons, soil porosity and fertility, eg ploughing, harrowing, compaction; the impact of cropping and the value of crop rotation; the role of both natural and artificial fertilisers in maintaining and developing soil properties; implications of intensive planting for soil management; sustainability criteria for plant and soil management practices

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	**To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:**	**To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:**
P1 explain the functions of the major internal and external structures of plants [SM2,3]	**M1** explain the function of the major specialist cells, tissues and organs of selected plants	**D1** assess how the function of internal and external structures of plants dictates their use in a selected industry
P2 explain the main processes of plant physiology [SM2,3]	**M2** explain how water uptake can be affected in selected plant species in given naturally-occurring and artificial situations	**D2** discuss how the manipulation of plant physiology and factors such as water uptake can enhance plant performance in a selected industry
P3 explain the life cycles of various plants [SM2,3]	**M3** explain how plant development processes relate to their life cycles	**D3** assess the relationships between plant nutrition and plant development
P4 carry out physical and chemical investigations to describe the characteristics of selected soils [IE2, TW1; SM2,3]	**M4** explain the relationships between plant nutrition and the characteristics of selected soils	**D4** evaluate the effects of the physical and chemical components of a selected soil on plant nutrition, and the implications of these for its sustainable uses by people
P5 describe, using evidence, some of the impacts upon plant communities and soil formation processes that human influences can have. [IE1; RL6; SM2,3]	**M5** explain, using evidence, the reasons for the impacts of humans on plant communities and soil formation processes.	**D5** assess, using evidence, the relative importance of different human influences on plant communities and soil formation processes.

PLTS: This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills applicable in the pass criteria. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

Key			
	IE – independent enquirers	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators

Essential guidance for tutors

Delivery

Tutors delivering this unit have the opportunity to use a wide range of techniques. Lectures, discussions, seminar presentations, site visits, supervised laboratory and field practicals, research using the internet and/or library resources and the use of personal and/or industrial experience would all be suitable. Delivery should stimulate, motivate, educate and enthuse learners. Work placements are an ideal vehicle for learning and, where used, should be monitored regularly to ensure the quality of the learning experience. Learners and supervisors must be made aware of the requirements of this unit before doing any work-related activities, so that evidence can be collected.

For example, learners may have the opportunity to use methods of modifying plant environments. They should be encouraged to ask for observation records and/or witness statements to be given as evidence. Guidance on the use of observation records and witness statements is provided on the Edexcel website. Whichever delivery methods are used, it is essential that tutors stress the importance of environmentally-sound sustainable management. Health and safety issues relating to working with soil and plant materials must be stressed and regularly reinforced, and risk assessments must be undertaken prior to practical activities.

Tutors should consider integrating the delivery, private study and assessment relating to this unit with any other relevant units and assessment instruments the learners are taking.

Learning outcome 1 is likely to be delivered by formal lectures, discussion, site visits, practicals, and independent learner research. Learners should be made aware of the structure, function and physiology of appropriately selected plants. Health and safety issues must be addressed before learners undertake any field or laboratory work. Adequate personal protective equipment (PPE) must be provided and used following the production of suitable risk assessments. Visiting expert speakers could add to the relevance of the subject for learners; for example, a horticulturalist, plant laboratory worker, or agronomist could talk about their work, the situations they face and the methods they use.

Learning outcome 2 covers plant life cycles, plant growth and development. Tutors should ensure that learners have access to a suitable range of plants that can be studied at appropriate development stages. Tutors can tailor the actual species to the sector and/or local environment. Learning outcome 2 is likely to be delivered by a combination of formal lectures, discussion, site visits, practicals, and independent learner research, although visits arranged principally to cover other topics will also provide useful information. Wherever possible, real results or data from live situations should be accessed.

Learning outcome 3 considers the principles of soil science and the relationship between plant nutrition and soil science. As well as formal lectures, laboratory experiments and field investigations are essential to deliver this learning outcome effectively. Experiments could include soil characteristics (including horizons), determining pH and nutrient values, measuring infiltration rates and determining particle size distribution. Field studies could include interpretation of soil pits, the effects of cultivations and detecting areas of over-use, compaction or erosion. As with other learning outcomes, centres must ensure that appropriate PPE is provided and risk assessments undertaken before any practical work or site visits. Visiting expert speakers, such as soil scientists or agronomists, could again be useful, and could describe practical aspects of managing soil structure and plant nutrition.

Learning outcome 4 considers ways in which people can influence plant and soil processes. As well as going to formal lectures, learners should spend time researching and investigating some of the human influences such as the impacts of deforestation and land clearance on plant communities and soil formation processes. Selective investigation will enable learners to achieve depth of study, but could be a selection from influences on infiltration and moisture retention, nutrient flow and nutrient cycle, soil stability, soil fauna, surface run off and erosion potential. A further focus for research should be the impact of different cultivation methods on soil horizons, soil porosity and fertility, such as ploughing, harrowing, compaction; the impact of cropping and the value of crop rotation. Learners should research and then apply sustainability criteria in order to evaluate particular environmentally sound plant and soil management practices.

Outline learning plan

The outline learning plan has been included in this unit as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan demonstrates one way in planning the delivery and assessment of this unit.

Topic and suggested assignments/activities and/assessment
Introduction to unit and programme of assignments.
Learning outcome 1 Tutor input: plant structure and functions. Practical work. Visit to plant laboratory or similar. **Assignment 1: Investigating the Functions of the Major Internal and External Structures of Plants (P1, M1, D1)**
Learning outcome 2 Tutor input: plant physiology (growth, development). Practical work. Independent learner research. **Assignment 2: Investigating the Main processes of Plant Physiology (P2, M2, D2)**
Tutor input: plant physiology (life cycles). **Assignment 3: Report on the Life Cycles of Selected Plants (P3, M3, D3)**
Learning outcome 3 Tutor input: soil science; plant nutrition. Practical work: soil characteristics; determining pH and nutrient values; measuring infiltration rates; determining particle size distribution. Field work: interpretation of soil pits; effects of cultivations; detecting areas of over-use, compaction or erosion. Guest speaker (possibly during field work). **Assignment 4: Investigating the Characteristics of Selected Soils (P4, M4, D4)**
Learning outcome 4 Tutor input: human influences on plant and soil processes. Independent learner research. **Assignment 5: The Impacts of Human Influences on Plant Communities and Soil Formation Processes (P5, M5, D5)**
Review of unit and programme of assignments.

Assessment

All the pass grade criteria must be met in order for a learner to achieve this unit.

For P1 and P2, learners must identify the major internal and external structures of selected plants, explain their functions, and explain the main processes of plant physiology. Tutors should identify the selected plants, or agree them in discussion with learners. Where possible, the size and complexity of the plants should be the same for each learner to ensure the fairness of assessment. As a minimum, learners must provide evidence for **three** different species of plant when investigating structures and functions of plants, and **evidence** relating to photosynthesis, respiration and water uptake, movement and loss in terms of their physiology. This criterion could be assessed directly by the tutor during practical activities. If this format is used, observation records would be suitable evidence from guided activities. These should be completed by the learners and the tutor and accompanied by appropriate worklogs or other relevant learner notes. If assessed during a placement, witness statements should be provided by a suitable representative and verified by the tutor. Alternatively, evidence could take the form of a pictorial presentation with notes (possibly using appropriate software or OHPs), an annotated poster, leaflet or project.

For M1, learners must explain the function of the major specialist cells, tissues and organs of selected plants. Tutors should identify the selected plants, or agree them in discussion with learners. These may be the same plants as those used to provide evidence for other grading criteria. Where possible, the size and complexity of the plants should be the same for all learners to ensure the fairness of assessment. As a minimum, learners must provide evidence for **three** different species of plant. This could take the form of a pictorial presentation with notes (possibly using appropriate software or OHPs), an annotated poster, leaflet, laboratory book or project. For M2, learners must explain how water uptake can be affected in selected plant species in given naturally-occurring (eg outdoor) and artificial (eg laboratory or greenhouse) situations. Tutors should identify the selected plants and the situations, or agree them in discussion with learners. These may be the same plants as those used to provide evidence for other grading criteria. Where possible, the size and complexity of the plants and the situations should be the same for each learner to ensure the fairness of assessment. As a minimum, learners must provide **evidence** for **three** different species of plant. Evidence may be in the same form as for P2.

For D1, learners must assess how or to what degree the function of internal and external structures of plants relates to their use in a selected industry. They could select an industry (eg horticulture) that relates to their primary learning goal. For D2, they are required to discuss the manipulation of plant physiology to enhance plant performance in a selected industry. Learners' evidence must be contextualised so that they are able to assess specific examples of manipulation (eg factors such as water or nutrient uptake or light availability) undertaken in a selected industry. This may be the same as that used to provide evidence for other grading criteria. For example, learners could assess the manipulation of woodland canopies to create clearings, the irrigation of crops or ventilation, or the use of controlled environments for crop storage. Evidence may be presented in the same form as for P1 or M1.

For P3, learners must explain the life cycles of selected plants. As a minimum, learners must provide evidence that covers three species of plant with different life strategies. These may be the same species as those used for other grading criteria. Learners could include annotated diagrams showing the botanical features involved at each stage. Centres should endeavour to make this criterion as relevant as possible to the endorsed title learners are studying. The species studied could include weed species. Evidence for this could take the form of a pictorial presentation with notes (possibly using appropriate software or OHPs), an annotated poster, leaflet or project.

For M3, learners must explain how plant development processes relate to their life cycles. Learners could use examples of plants at various stages of growth and development that they have worked with during the delivery of this unit. Evidence may be presented in the same form as for P1, and may be linked to the assessment of P2 and P3.

For D3, learners are required to assess the relationships between plant nutrition and plant development. They may link the evidence for this criterion with that for others, such as M2 and M3. Learners must consider all of the important stages in the life cycle of plants, possibly citing examples that they have worked with or used as evidence for other grading criteria. Evidence may be presented in the same form as for P3.

For P4, learners must carry out physical and chemical investigations to describe the characteristics of selected soils. As a minimum, learners must provide evidence for three distinctly different soils (eg a sandy soil, a clay soil and a peaty soil). Evidence for this could take the form of a pictorial presentation with notes (possibly using appropriate software or OHPs), an annotated poster or leaflet, or a project. Alternatively, learners could provide evidence taken from field notes in which soil pits have been dug, and laboratory books.

For M4, learners must explain the relationships between plant nutrition and the characteristics of selected soils. They must include both major and minor nutrients in their evidence. They must explain the influences that soil structure and chemical composition have on plant growth and development, the effects that plants can have on soils, for example, by adding nutrients (legumes), organic matter, etc. Learners must also explain the effects that nutrient deficiency and excess can have on plants. They must also explain the relationships between the physical characteristics of soil and plant growth, for example, for root development and anchorage. Evidence for this criterion may be linked to that for others, eg P3 and P4.

For D4, learners are required to evaluate the effects of the physical and chemical components of a selected soil on plant nutrition, and the implications of these for its sustainable uses by people. For example, they could include the effects of soil pH on the availability of nutrients, an evaluation of, for example, the effects of soil compaction on root growth, or the effects of soil erosion or nutrient depletion on plant growth or yield, and how remedial action can be taken. Learners could contextualise their evidence to the industry that is their primary learning goal.

For P5, learners must research material that helps them to describe ways in which people influence plant and soil processes. There are many, so tutors are encouraged to help learners be selective. Three different environments will help to show variety; they could include local studies (for instance in an urban and a rural area), plus a distant locality, or wherever areas of interest occur. As well as going to formal lectures, learners should spend time researching some of these influences, eg the impacts of deforestation on plant communities and soil formation processes. They could produce a presentation or website on their research that includes annotated diagrams, or photographs, with accompanying descriptive text. Appropriate soil processes could include infiltration, moisture retention, soil stability, or soil fauna. These could be researched practically during visits or work placements to smallholdings or working farms. In such eventualities, learners could keep a learning log, enhanced by personal research.

For M5, learners must research material that helps them to explain how people influence plant and soil processes. Three different environments will help to show variety; they could include local studies (for instance in an urban and a rural area), plus a distant locality, or wherever areas of interest occur. These may be the same places or processes as those used to provide evidence for other grading criteria. As well as going to formal lectures, learners should spend time researching some of these influences. They could use the same mode of presentation or website as for P4, but must show full explanations of particular soil processes and human impact. These could be researched practically during visits or work placements to smallholdings or working farms. In such eventualities, learners could keep a learning log, enhanced by personal research.

For D5, learners must research material that helps them to assess the relative importance of different ways in which people influence plant and soil processes. Tutors should enable learners to develop critical skills and select criteria by which they can achieve this. The same three environments used to provide evidence for other grading criteria may be used, but learners should be able to assess how other kinds of environment may be different. As well as formal lectures, learners should spend time assessing the importance of human influences. They could use the same mode of presentation or website as for M5, but must show an ability to assess and evaluate via the presentation or accompanying text. The same practical research as used for M5 arising from visits or work placements to smallholdings or working farms may be applied. Learners must apply sustainability criteria in order to evaluate particular environmentally sound plant and soil management practices. To achieve this, tutors should ensure that learners are taught a range of environmentally sustainable criteria which they are able to apply critically to situations.

Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the assessment and grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1, M1, D1	Investigating the Functions of Major Internal and External Structures of Plants	Laboratory investigation of plant structures, supported by group research into their functions.	A report on the findings.
P2, M2, D2	Investigating the Main Processes of Plant Physiology	One or more visits to a plant nursery or plant research centre.	A learning journal kept during visits, based on work done at the location.
P3, M3, D3	Report on the Life Cycles of Selected Plants	Practical observations of plants grown on site in school greenhouse or plot; or allotment.	A report for parents on work done in the school or college grounds or allotment for the website.
P4, M4, D4	Investigating the Characteristics of Selected Soils	Soil analysis based on soil pits dug at different points on a local farm.	A report for the farmer about soil characteristics on the farm.
P5, M5, D5	The Impacts of Human Influences on Plant Communities and Soil Formation Processes	Group research exercise into the impact of human activity on different biomes and their sustainability.	A presentation, using appropriate software, from each group, or website on the varying impacts of human activity followed by an individual report on the implications of these activities for sustainability.

Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC Applied Science sector suite. This unit has particular links with the units shown below in the BTEC Applied Science suite of qualifications:

Level 2	Level 3
Monitoring the Environment	Fundamentals of Science
Growing Plants for Food	Working in the Science Industry
	Scientific Investigation
	Scientific Practical Techniques
	Science for Environmental Technicians

Essential resources

There are many opportunities for practical and experimental work in this unit. Therefore learners should have access to adequate field and laboratory facilities for the investigation of plant structures, germination, photosynthesis, osmosis, transpiration, soil textures and structures.

A suitable range of plants and plant material should be available for learners to study.

There should be access to light microscopes to study cell structures. Learners should have access to current health and safety regulations and equipment. Links with, for example, farmers, horticulturalists and growers (including allotments) will enable access to a range of soil types and growing regimes.

Learners also need access to computers for research and presentation of assignments.

Employer engagement and vocational contexts

Learners will depend on the availability of local companies according to the local environment in which they live or work, so a rural area may offer very different experiences from an urban one. However, this list should be indicative of the kinds of companies that work in areas related to this unit. The organisations are sometimes national, but will offer help locally.

Farming

NFU (The UK National Farmers Union) – www.nfuonline.com

Horticulture

Large companies such as Wyvern have their own website; the general website for UK Horticulture is www.thegardeningwebsite.co.uk, which is organised by county or district, so that you can find local companies easily.

Soil science

The British Society of Soil Science – www.soils.org.uk

Useful for learners and for finding out more about soils in your area – www.soils.org.uk/education.htm

Research laboratories

Most of these are privately owned, and part of large multi-nationals.

The UK government DEFRA website is www.defra.gov.uk

Local authorities

Allotments or nurseries – type in *www.* followed by your county or borough name, followed by *.gov.uk.* You should then be able to access all local services relating to local authority nurseries or allotment services.

Indicative reading for learners

Textbooks

Cutler D, Botha T and Stevenson D – *Plant Anatomy: An Applied Approach* (Wiley-Blackwell, 2007) ISBN 9781405126793

Davies B, Eagle D and Finney B – *Soil (Resource Management Series)* (Farming Press, 2002) ISBN 9780852365595

Graham I – *Soil (Earth's Precious Resources Series)* (Heinemann Library, 2004) ISBN 9780431115542

Lockhart J A R and Wiseman A J L – *Lockhart and Wiseman's Introduction to Crop Husbandry, 7th Edition* (Butterworth-Heinemann, 1993) ISBN 9780080420035

Raven P, Johnson G, Singer S, Losos J and Mason K – *Biology, 8th Edition* (McGraw-Hill Higher Education, 2007) ISBN 9780030922022

Ridge I – *Plants* (Oxford University Press, 2002) ISBN 0199255482

Roberts M, Reiss M and Monger G – *Biology: Principles and Processes* (Nelson Thornes, 2000) ISBN 9780174481768

Soffe R – *The Agricultural Notebook, 20th Edition* (Wiley-Blackwell, 2003) ISBN 9780632058297

Stern K – *Introductory Plant Biology* (McGraw-Hill Education, 2007) ISBN 9780071102179

Journals

Arable Farming

Crops

Crop Science

Landwards

Websites

www.intute.ac.uk/healthandlifesciences/agriculture	Agriculture, Food and Forestry
www.bbsrc.ac.uk	Biotechnology and Biological Sciences Research Council
www.defra.gov.uk	Department for Environment, Food and Rural Affairs
www.hse.gov.uk	Health and Safety Executive
images.botany.org	Botanical Society of America Online Image Collection
www.lantra.co.uk	Lantra, the Sector Skills Council for environmental and land-based industries
www.rothamsted.ac.uk	Rothamsted Research
www.s-cool.co.uk	S-cool, revision site
www.saps.plantsci.cam.ac.uk	Science and Plants for Schools
www.sebiology.org	The Society for Experimental Biology

Delivery of personal, learning and thinking skills

The table below identifies the opportunities for personal, learning and thinking skills (PLTS) that have been included within the pass assessment criteria of this unit.

Skill	When learners are ...
Independent enquirers	[IE1] describing, using evidence, the impacts of humans on plant communities and soil formation processes [IE2] carrying out physical and chemical investigations to describe the characteristics of selected soils, and explaining the relationships between plant nutrition and the characteristics of selected soils
Reflective learners	[RL6] communicating their learning in different ways
Team workers	[TW1] carrying out physical and chemical investigations to describe the characteristics of selected soils
Self-managers	[SM2,3] taking responsibility for their own learning programme for each assignment.

Although PLTS are identified within this unit as an inherent part of the assessment criteria, there are further opportunities to develop a range of PLTS through various approaches to teaching and learning.

Skill	When learners are ...
Independent enquirers	[IE4] doing individual research exercises and investigations
Creative thinkers	[CT3] considering criteria for sustainable use and management of plant and soil resources
Reflective learners	[RL5] evaluating evidence and making judgments – eg of the relative importance of different human influences on plant communities and soil formation processes
Team workers	[TW2,3] working as part of a team in planning and carrying out physical and chemical investigations to describe the characteristics of selected soils
Self-managers	[SM1] using evidence – eg to explain the relationships between plant nutrition and the characteristics of selected soils.

Functional Skills – Level 2

Skill	When learners are ...
ICT – Develop, present and communicate information	
Enter, develop and format information independently to suit its meaning and purpose including: • text and tables • images • numbers • records	producing reports
English	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	taking part in group discussions about human impacts on plant communities and soil formation processes
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	researching the function of specialist cells, tissues and organs of plants
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	producing a report on the life cycles of plants or the characteristics of soil.