Unit 10: Undertake an Investigative Project in the Environmental Sustainability Sector

Unit code: L/602/5982

QCF Level 3: BTEC National

Credit value: 10

Guided learning hours: 60

Aim and purpose

This unit enables learners to gain skills in planning and undertaking an appropriate investigative project in the environmental sustainability sector. Learners will also develop skills in data interpretation and analysis and how to present the project following standard scientific format.

Unit introduction

Research projects are often undertaken within the environmental industries in order to create or improve a product, service or process. The ability to undertake a research project requires learners to develop important skills that will influence the scope of the project and how successful it is. This unit gives learners the opportunity to develop project management skills by investigating a chosen topic area through a project of their choice. The knowledge and skills developed in this unit will link to and enhance most of the other units learners take as part of their programme of study.

Learners will explore a topic that is of interest to them and is relevant to their career aspirations. Learners will plan for their investigative project study by researching their chosen topic area and producing a breakdown of resources and a project plan.

Learners will develop the ability to take responsibility for their own learning by independently identifying a research problem to be solved. Determining the solution to their research problem could have a number of benefits such as helping to improve educational practice or helping learners develop useful skills. Whatever the rationale for developing their research proposal, it is important that the research topic is of personal interest to the learner. The research problem may arise from a real-world setting or be generated from theoretical concepts. Whichever route learners choose to take, it is paramount that in order to propose a valid research problem they have, or acquire, an in-depth knowledge about their topic of personal interest.

Learners will then implement, carry out and complete their investigative project. They will work towards deadlines and monitor the project performance. Learners will report and draw conclusions from their investigations, looking at the project outcomes, whether the schedule plan met the project aims and objectives, and how improvements could be made in the future.

Learning outcomes

On completion of this unit a learner should:

1 Be able to propose a suitable topic for an investigative project in the environmental sustainability sector

2 Be able to plan for an investigative project in the environmental sustainability sector

3 Be able to carry out an investigative project in the environmental sustainability sector

4 Be able to report on an investigative project in the environmental sustainability sector.

Unit content

1 Be able to propose a suitable topic for an investigative project in the environmental sustainability sector

Research proposal: area of study (rationale for selection); background to the problem; review of associated literature; aims; objectives; potential difficulties; method; scope and limitations; implications

Investigative project: information gathering eg internet, publications, discussion, media; safety considerations; other considerations eg control of variables

Resources: eg people, time, buildings, equipment, materials, media, IT applications, budget

2 Be able to plan for an investigative project in the environmental sustainability sector

Research design: statement of the problem, intended research topic/area; published research, the research paradigm; research hypotheses; variables; methodology; data analysis techniques; benefits of intended investigation; summary; references

Schedule plan: aims; objectives; start date; completion date; operations (tasks); timings (resource availability); contingency planning; remedial actions eg extra resources, schedule revision

3 Be able to carry out an investigative project in the environmental sustainability sector

Project: implementation (according to research design and method); health and safety (risk assessment); data collection eg qualitative, quantitative, systematic recording; monitoring of performance against schedule plan eg daily progress, weekly progress, monthly progress, budget, other appropriate measures, for each resource and/or task; deadlines; completion; communication

4 Be able to report on an investigative project in the environmental sustainability sector

Data results: presentation of data eg use of tables, use of graphs; data interpretation eg selection of appropriate methods of analysis, use of appropriate statistical test(s), level of significance

Report: aims; objectives; schedule plan; summary of work; unforeseen circumstances; method; results; conclusions; evaluation (strengths, areas for improvement); recommendations for further research; bibliography; referencing

Presentation of project report: title page; contents page; introduction; review of literature; method; project aim and objectives; hypothesis; results; discussion; conclusion; references (Harvard Referencing System); appendices

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 produce a valid research proposal for an identified investigative project in the environmental sustainability sector [IE1, 2, 3]	**M1** explain the reasons for choosing a selected investigative project in the environmental sustainability sector	**D1** justify the selected research design for an investigative project in the environmental sustainability sector
P2 describe relevant resources required, including support procedures [IE1, 2; CT1, 2, 3]		
P3 produce an appropriate, valid research design for an investigative project in the environmental sustainability sector [SM1, 2, 3, 4]		
P4 produce a relevant schedule plan to carry out a selected investigative project in the environmental sustainability sector [SM1, 2, 3, 4]		
P5 carry out a selected investigative project in the environmental sustainability sector, using safe working practices [CT2, 4, 5, 6]	**M2** explain why identified resources are appropriate to a specified schedule of operations	
P6 document work undertaken in a systematic manner, amending the schedule plan as appropriate [CT2, 4, 5, 6; SM2, 3]		

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:**
P7 monitor own progress using appropriate methods, including ability to work to deadlines [SM2, 3, 4, 5]	**M3** explain the importance of regularly monitoring performance against a selected investigative project's schedule of operations	
P8 discuss the health and safety implications of the selected investigative project [SM2, 3, 4, 5]		
P9 interpret collected data to describe the results of the investigative environmental sustainability project		
P10 report and draw conclusions from a selected investigative project in the environmental sustainability sector using relevant terminology [IE4, 6; RL5, 6]	**M4** evaluate achievements and areas for improvement of a selected investigative project.	**D2** analyse results from the investigative project, justifying areas for further research.
P11 present the investigative project following accepted scientific format. [IE6; RL5, 6]		

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

Delivery of this unit will involve learners identifying and carrying out an investigative project in the environmental sustainability sector. Unit delivery could be linked to work experience placements.

The learning outcomes cover the identification, planning, carrying out and reporting of an investigative project. It is important that the research topic is of personal interest to learners and that learners possess or acquire an in-depth knowledge and understanding of the topic and related areas. The project could be linked to the learners' career aspirations in the environmental and/or sustainability sector.

Although a major part of the delivery focuses on learners practically conducting their investigative projects, the unit must be supported by theoretical input from tutors. Learners must understand concepts related to the research proposal and design as well as research skills, techniques and methodologies before they can consider, explore and produce a valid research proposal.

At the research proposal stage, tutors may, if necessary, help shape the proposal and give learners direction to ensure a valid research proposal is presented. The research proposal will require learners to adopt an in-depth investigative approach and will include the background to the problem and factors related to it. At this stage tutors should direct learners to consider why the proposed investigation is worthwhile, who the results would be useful to, what the research problem is, what the literature says, and what the investigation would contribute to the field of environmental sustainability.

For learning outcome 1, learners need to propose and research a suitable topic for their investigative project. Delivery will include formal input from tutors, including research methods and techniques, sources of information, how to conduct a literature review and how to design a valid research proposal. Learners need to select a topic for investigation from the environmental sustainability sector that forms a suitable and worthwhile basis for their investigative project. Learners must also give due consideration to availability of, and access to, resources for their investigation. Learners need to undertake independent research and, in consultation with the tutor, agree the selected topic on which to base their investigative project.

Learning outcome 2 covers the planning for the project. Learners need to produce a valid research design for their investigative project which will include a review of the literature and statement of the problem, research hypotheses, methodology (to include health and safety considerations for the project and control of variables), their intended data analysis techniques, why the investigation is of benefit (and who to) and their project references.

Learners also need to create a schedule plan of operations that identifies all the tasks and timings from the beginning of the project to the end. The plan also needs to include contingency planning and remedial actions. This could be delivered using lectures, planning seminars, practical sessions and/or independent research.

For learning outcome 3, learners will carry out their investigative project in the environmental sustainability sector. Learners could keep a project diary that records the planned tasks and when the actual tasks were completed. Monitoring worksheets could also be used to record the progress of the project against the plan of operations. Witness statements and/or observation records could also be used to confirm learners' progress and achievements. Delivery is likely to include learners independently undertaking their practical work and/or project workshops/seminars.

Learning outcome 4 covers the reporting of the investigative project. Seminars and presentations are good ways for learners to cover the requirements of reporting their project results and conclusions. Seminars also provide appropriate opportunities for learners to develop skills in evaluation and critical analysis. Independent learner work will be required for the actual report write-up and presentation of the investigative project following standard scientific format.

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 the unit, structure and programme of assignments.
Assignment 1: Project Planning (P1, P2, P3, P4, M1, D1) Tutor introduces the assignment brief.
Formal input and learner research identifying potential topics.
Formal input: research methods and techniques, sources of information.
Learner research: viability of potential projects. Producing the research proposal.
Visits and visiting speakers (according to learner need). Producing the research design.
Preparation of materials for assignment 1. Learner seminars/presentations for assignment 1.
Assignment 2: Project Implementation (P5, P6, M2, P7, P8, M3) Tutor introduces the assignment brief.
Formal input and discussion.
Health and safety – carry out risk assessments.
Devise a work log/diary/monitoring system.
Carry out the research project: independent learner activities.
Preparation of materials for assignment 2.
Assignment 3: Project Report and Conclusions (P9, P10, P11, M4, D2) Tutor introduces the assignment brief.
Formal input and discussion – report writing.
Statistical tests: learner tasks and activities.
Formal input: analysis of data collected.
Preparation of project report.
Preparation of presentation.
Delivery of presentation.
Unit review and evaluation.

Assessment

Criteria P1, P2, P3, P4, M1 and D1 cover the project proposal and planning and could be assessed together. For P1, learners need to select and carry out research into a suitable topic for an investigative project in the environmental sustainability sector, producing a valid research proposal.

Learners should select a topic of personal interest on which to base their research project, which may have an environmental and/or sustainability focus and could arise from any unit on the learner's programme of study. The intended topic selection should be made in consultation with the tutor to ensure that a viable, valid project is chosen. Learners need to produce a valid research proposal for their investigation, which will include the rationale for the project selection, the background to the problem, a review of the associated literature, project aims and objectives, potential difficulties, method, scope and limitations and implications.

For P2, learners need to describe the resources required for their investigative project, including support procedures. For P3, learners need to produce a valid research design for their project, which must cover the areas stated in the *Unit content*. For P4, learners need to produce a relevant schedule plan covering project aims and objectives, start and completion dates, operations, timings, contingency planning and remedial actions.

For M1, learners need to explain why they have chosen their project and for D1, they need to justify their selected research design. Learners should give reasons and/or evidence to support their opinions and views to show how they arrived at the intended research design.

A suitable assessment method for P1, P2, P3, P4, M1 and D1 would be for learners to verbally present their research proposal and design to peers, supported by production of a written copy. By completing a presentation, tutors and other members of the group will be able to raise questions relating to the research proposal, resources and/or design, which may further help to shape the intended investigative project. Tutors should complete observation records to support this assessment activity and confirm learners' achievement.

Criteria P5, P6, M2, P7, P8 and M3 involve learners carrying out their environmental sustainability project and are best assessed together. Assessment evidence could include a diary and/or log which learners use to record the project work undertaken and monitor progress made. These criteria may also be assessed directly by tutors whilst learners are carrying out their projects. If this format is used, then suitable evidence from guided activities would be observation records completed by tutors accompanied by appropriate work logs or other relevant learner diaries/notes. If assessed during a work placement, witness statements should be provided by a suitable representative and verified by tutors. Learners need to produce a risk assessment for their project and discuss the health and safety implications associated with carrying out an investigative project in the environmental sustainability sector.

For M2, learners need to explain why the identified resources are appropriate to their planned schedule of operations and for M3, to explain the importance of regularly monitoring performance against the project's schedule of operations. Learners should give reasons and/or evidence to support their explanations. Learners should include in their evidence problems that may occur with a project if regular monitoring of performance does not occur.

For P9, P10, P11, M4 and D2, learners need to prepare a report on their investigative project in the environmental sustainability sector. This could be assessed through one assignment. For P9, learners need to use appropriate techniques to interpret data collected, describing their results. For P10, learners need to produce a report and draw conclusions from the project covering the areas stated in the *Unit content* and, for P11, they need to present the project following standard scientific format.

For M4, the report must include an evaluation of the project achievements and areas for improvement. For D2, learners need to analyse the project results, justifying areas for further research. Learners should provide reasons and/or evidence to support their opinions and views.

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, P2, P3, P4, M1, D1	Project Planning	You work for the research department of a large environmental organisation. Within the next few months you have the opportunity of promotion and as part of the selection process you have been asked to undertake a research project. Produce a valid research proposal, research design and schedule plan. Describe the project resources.	Research proposal. Research design. Schedule plan. Seminar/presentation. Observation records.
P5, P6, M2, P7, P8, M3	Project Implementation	Produce a risk assessment for the project and discuss the health and safety implications of the project. Carry out the investigative project, keeping a record of your progress. This could be in the form of a log or diary that shows work undertaken and how you met deadlines set for yourself.	Report. Diary/log. Witness statements/ observation records.
P9, P10, P11, M4, D2	Project Report and Conclusions	Interpret data collected to describe results. Report and draw conclusions from the project and present using accepted scientific format.	Report. Presentation. Observation records.

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

This unit forms part of the BTEC Environmental Sustainability sector suite. This unit has particular links with the following units in the BTEC Environmental Sustainability suite:

Level 3
Understand the Principles of Sustainable Development
Informatics for Environmental and Sustainability Industries
Understanding the Principles of Wildlife Populations, Ecology and Conservation
Work-related Experience in the Environmental Sustainability Sector
Using Statistics in Science
Waste Management
Pollution Control and Management
Sustainable Transport

Essential resources

Learners need access to suitable resources that they have identified for completion of their investigative project. Resource requirements must be agreed with the tutor before the project starts.

Employer engagement and vocational contexts

Visits to relevant establishments and use of visiting speakers from the environmental sustainability sector together with relevant work experience placements will help give the unit vocational relevance.

Indicative reading for learners

Textbooks

Applegarth M and Posner K – *Project Management Pocketbook* (Management Pocketbooks, 2008) ISBN 9781903776872

Barker S and Cole R – *Brilliant Project Management: What the Best Project Managers Know, Do and Say* (Prentice Hall, 2009) ISBN 9780273722328

Buckingham S and Theobald K – *Local Environmental Sustainability* (Woodhead Publishing, 2003) ISBN 9781855736856

Fleming I – *Time Management Pocketbook* (Management Pocketbooks, 2003) ISBN 9781903776087

Hill J and Gale T – *Ecotourism and Environmental Sustainability: Principles and Practice* (Ashgate Publishing, 2009) ISBN 9780754672623

Kahraman E and Baig A – *Environmentalism: Environmental Strategies and Environmental Sustainability* (Nova Science Publishers, 2010) ISBN 9781607416340

Lock D – *Project Management* (Gower Publishing, 2007) ISBN 9780566087721

Nokes S and Kelly S – *The Definitive Guide to Project Management: The Fast Track to Getting the Job Done on Time and on Budget* (Financial Times Series, 2007) ISBN 9780273710974

Portny S E – *Project Management for Dummies* (John Wiley & Sons, 2006) ISBN 9780470049235

Primack R B – *Essentials of Conservation Biology* (Sinauer Associates, 2010) ISBN 9780878936403

Russell D and Harshbarger C – *Groundwork for Community-based Conservation: Strategies for Social Research* (AltaMira Press, 2003) ISBN 9780742504387

Sutherland W J and Hill D A – *Managing Habitats for Conservation* (Cambridge University Press, 1995) ISBN 9780521447768

Websites

Association for Project Management	www.apm.org.uk
Carbon Trust	www.carbontrust.co.uk
Project Management Institute	www.pmi.org.uk
Project Manager Today	www.pmtoday.co.uk

Journal

Project Manager Today

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	producing a valid research proposal describing relevant resources required for their project reporting and drawing conclusions from their investigative project presenting their investigative project following accepted scientific format
Creative thinkers	describing relevant resources required for their project carrying out their investigative project documenting work undertaken in a systematic manner
Reflective learners	reporting and drawing conclusions from their investigative project presenting their investigative project following accepted scientific format
Self-managers	producing a valid research design producing a relevant schedule plan documenting work undertaken in a systematic manner monitoring own progress using appropriate methods discussing the health and safety implications of their investigative project.

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 ...
Team workers	working with others on implementing an investigative project
Effective participators	taking part in class discussions to identify and critique potential research projects
Self-managers	researching information sources carrying out their research project.

Functional skills – Level 2

Skill	When learners are ...
ICT – using ICT	
Plan solutions to complex tasks by analysing the necessary stages	planning and implementing an investigative project
Select, interact with and use ICT systems safely and securely for a complex task in non-routine and unfamiliar contexts	researching information for potential research projects
Manage information storage to enable efficient retrieval	saving information into files and folders
ICT – finding and selecting information	
Use appropriate search techniques to locate and select relevant information	planning which information to select and use for the presentation
Select information from a variety of sources to meet requirements of a complex task	carrying out the research project
ICT – developing, presenting and communicating information	
Enter, develop and refine information using appropriate software to meet requirements of a complex task	writing up the research project
Use appropriate software to meet the requirements of a complex data-handling task	analysing data collected during the investigative project
Use communications software to meet requirements of a complex task	contacting others by email for information exchange
Combine and present information in ways that are fit for purpose and audience	writing up the research project producing a presentation
Mathematics – representing	
Understand routine and non-routine problems in familiar and unfamiliar contexts and situations	carrying out statistical analysis of data collected during the research project
Identify the situation or problems and identify the mathematical methods needed to solve them	identifying an appropriate statistical technique to analyse data collected during the research project
Choose from a range of mathematics to find solutions	carrying out statistical analysis of data collected during the research project
Mathematics – analysing	
Apply a range of mathematics to find solutions	carrying out statistical analysis of data collected during the research project
Use appropriate checking procedures and evaluate their effectiveness at each stage	carrying out statistical analysis of data collected during the research project
Mathematics – interpreting	
Draw conclusions and provide mathematical justifications	reporting on their research project

Skill	When learners are ...
English – Speaking, Listening and Communication	
Make a range of contributions to discussions in a range of contexts, including those that are unfamiliar, and make effective presentations	taking part in class discussions about potential research projects
English – Reading	
Select, read, understand and compare texts and use them to gather information, ideas, arguments and opinions	reading documents which relate to their research project
English – Writing	
Write a range of texts, including extended written documents, communicating information, ideas and opinions, effectively and persuasively	writing documents which relate to their research project.