



Unit 6: Investigative Project

Delivery guidance

Approaching the unit

This is a practical unit which gives your learners the opportunity to carry out a successful practical vocational investigate project that they are interested in and have chosen in consultation with their tutor. Learners can use and adapt some of the key skills and techniques that they have previously used in a work experience placement or in education and used in other practical experimental units on the course.

Universities and industries welcome learners that have good knowledge and understanding, and that they have excellent practical experimental, employability and project management skills. Learners will learn and reinforce the importance of a number of these key skills in literature search and review, planning, implementing, collecting and analysing, and presenting results from their chosen project.

To complete this unit your learners will need access to a laboratory or, for a field trip, a range of equipment, apparatus and materials for practical work. They will also need logbooks, diaries and materials for presenting projects as well as access to research materials – which includes the internet, CD-ROMs, software packages, journals or magazines, and books.

The delivery methods proposed for this unit are, for example:

- Discussions – class and small group discussions on the various stages of the project and the use of project case studies.
- Tutor presentation and guidance – briefing and monitoring learners at each stage of the project.
- Individual learner activity – where learners complete each stage of the project.
- Video clips – from which learners can learn and reinforce their knowledge about different experimental practical techniques and methods.

Delivering the learning aims

For learning aim A, introduce the unit by giving an overview and describing how it fits within the qualification and relates to other units. Discuss with the learners various types of vocational investigative science projects that previous learners have carried out and having learners share experiences of completing any assignments and projects they themselves have completed previously. Guest speakers – for example, from STEMNET – could be invited to inspire learners about carrying out vocational projects and how important this is in industry or university. They could also discuss the importance of employability skills that can be used during the completion of projects – such as problem solving, finding creative solutions and developing interpersonal and intrapersonal skills. You could then discuss with the learners ideas about what sort of project they would like to carry out as an individual. At this stage you could give an initial approval of their proposed area of study and ensure that there are the appropriate

resources available to complete this type of project. You could then brief the learners about the requirements of project proposal aspects such as the need for a title, aims and SMART objectives, hypothesis and potential limitations for the project.

You could then provide input on how to carry out a literature search and review. This could be done by demonstration using the internet to show learners how to identify the location of reliable and suitable sources of information from websites that can be referenced. Learners then could carry out their literature search and review with guidance. Once the learners have completed their search and review you could give final approval for their projects subject to available resources. This may also require discussion with technical staff about available resources or the need to purchase or to make or adapt suitable equipment.

For learning aim B, you could brief learners about schedules of work, with timelines, milestones and the importance of target dates. This will help prepare them to write their own schedule of work and how to monitor their progress using logbooks and diaries. Learners should then complete a schedule using a template with realistic timelines taking into account the number of hours available. Once completed you could then approve the learner's schedules. This would lead on to the learners needing to produce a realistic plan. You could brief the learners how to go about producing a plan using a typical template for this level of learner and how they would need to implement the project using the required resources. You could also highlight the need for learners to plan how to set up equipment, instruments or sensors, or prepare resources for fieldwork, and decide how they are going to collect, record, analyse and present data. Learners would then produce their project plan and seek to gain your approval. Once approval is given you could then present and discuss with them the need to ensure they have thought about contingency planning and what remedial action to take when necessary.

You could then brief learners on health and safety issues, explain who will carry out risk assessments and ensure they take into account ethical and legislative issues. You could also ask a guest speaker to outline the importance of health and safety – this could be a health and safety representative from your centre or an outside speaker. Learners would then need to go through their practical work and identify any requirements or issues, and complete any risk assessments that are required using a typical template or gain approval for ethical considerations. You may then need to approve any requirements.

For learning aim C, the implementation stage could be introduced ensuring that the learners are prepared for this stage and discussing any issues that they have before they go ahead. Learners could then start the practical part of their projects using approved procedures and practices and adhering to health and safety requirements and outcomes of risk assessment and ethical considerations. Learners would need to take responsibility of showing you that they are keeping their logbooks and diaries up to date.

Learners would then need to take, collect and record data, ensuring they are taking into account accuracy, errors, reliability, integrity and precision. They would then need to use appropriate methods to check the data is fit for purpose, reliable and valid. You could then brief the learners about presentation of data and they would need to take the responsibility to ensure their presentation of data is fit for purpose.

For learning aim D, you could brief the learners about methods of evaluating their findings using scientific protocol and terminology to include advice about referencing and bibliography, giving a guide to the word count expected for the finalised project report. Learners will then need to complete their project reports up to the evaluation stage.



Finally, you could brief and discuss with them methods of evaluating their findings. Learners would then need to complete the write up of their project to include conclusions, proof of hypothesis, areas for improvement and any recommendations of further work. Learners would then need to present their report using an appropriate method.

Learning aim	Key content areas	Recommended assessment approach
A Undertake a literature search and review to produce an investigative project proposal	A1 Literature review A2 Investigative project proposal	Present a project plan proposal supported by a logbook.
B Produce a plan for a vocational investigative project based on the proposal	B1 Schedule B2 Plan B3 Health and safety and ethical considerations	Present a project plan proposal supported by a logbook.
C Safely undertake the project collecting, analysing and presenting the results	C1 Experimental procedures and techniques C2 Collect, collate and analyse data C3 Data presentation	Present an evaluative report of the final project.
D Draw conclusions and evaluate the project using correct scientific principles	D1 Scientific report for investigative project D2 Scientific evaluation of findings	

Assessment guidance

This unit is internally assessed through a number of independent tasks. Each task should cover at least one entire learning aim and it is essential that a learning aim is assessed as a whole and not split into tasks or sub-tasks per criterion.

There are three suggested summative assignments for this unit as shown in the unit specification, each covering one or more learning aims. All learners must independently generate individual evidence that can be authenticated. The main sources of evidence are part of the final project report.

Learners should incorporate in-depth research that is corroborated by a fully referenced bibliography. Learners need to produce their final report in a style that allows assessors to assess the evidence presented for each individual criteria and to ensure that three assignment themes are present.



BTEC assessors should complete observation records and perhaps video learners. Technical staff could complete witness statements for relevant assessment criteria. Observation records alone are not sufficient sources of learner evidence; they should be used to support the original learner-generated evidence in the project report.

For learning aim A, learners develop skills in using systems and technology in their literature search and review. They also develop critical thinking skills in the analysis of their literature search, including potential limitations in their project proposal and justifying their chosen hypothesis. Their project proposal could also include non-routine problem-solving skills and creative solutions.

For learning aim B, learners need to use problem-solving skills in contingency planning and justify changes to their project plan.

For learning aims C and D, learners develop negotiating and influencing skills throughout and critical thinking and problem-solving skills in justifying and reflecting on their conclusions and the limitations of their project.

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Getting started

This provides you with a starting place for one way of delivering the unit, based around the recommended assessment approach in the specification.

Unit 6: Investigative Project
<p>Introduction</p> <p>Begin by introducing the unit to learners through presentation and discussing the unit specification, learning outcomes and assessment criteria and how it is assessed.</p>
Learning aim A – Undertake a literature search and review to produce an investigative project proposal
<ul style="list-style-type: none"> • You could brief learners about the choice of relevant areas of study for a project. Ask learners to collaborate in small groups to come up with examples of different projects that they have experienced. Each learner could then contribute to a class discussion on the type of projects they have experienced in education or through work experience. You could provide learners with previous project titles carried out at the centre and any case studies of previous projects. • You could ask guest speakers to come in and discuss science projects and the importance of employability and project management skills, and the prospects of engaging with industry. • Ask learners to decide as an individual or in a group the area of study they are interested in, its vocational aspect and industrial sector. Learners should discuss their area of study with the tutor for approval. • You should give a presentation to learners about how to go about carrying out a literature search and review, covering identification, location, reliability, extraction and referencing of sources of information. • Ask learners to carry out their literature search and review in preparation for their project proposal. • You should brief learners about project proposals to ensure they propose its title, aims and objectives, hypothesis, resources and any potential limitations. • Ask learners to produce their project proposal as an individual. • You should approve project proposals.
Learning aim B – Produce a plan for a vocational investigative project based on the proposal
<ul style="list-style-type: none"> • You could provide learners with a schedule of work template and brief them about start date, completion date, realistic timelines, milestones, and setting and achieving target deadlines. You should provide them with logbooks and diaries. • Ask learners to prepare their schedule of work and timeline for approval. • You should brief learners about producing a realistic working plan using a typical template, taking into account how they will implement the project with the resources required and how they are going to collect, record, analyse and present data. • Ask learners to produce their project plan. • You should then brief learners on contingency planning and lead a discussion about remedial actions to make changes to the plan.

**Unit 6: Investigative Project**

- You should give a presentation and discuss with learners the need for health and safety, risk assessments and ethical considerations, taking into account legislative, COSHH and PPE requirements.
- You could ask a health and safety representative to give a presentation, or an outside health and safety guest speaker.
- Ask learners to identify health and safety and ethical consideration aspects of their project. Learners to also complete relevant risk assessments.

Learning aim C – Undertake the project collecting, analysing and presenting the results

- You should begin by briefing and discussing with learners the need for good practical skills, to ensure they are using safe working practices when following procedures and practices, and when using equipment and instruments. The need to collect, record and analyse data, taking into account the need for accuracy, reliability, validity, precision and integrity, using appropriate methods of data processing and analysis.
- Also remind them about monitoring their projects using logbooks and diaries.
- Learners carry out the implementation stage, noting any limitations and improvements.
- You could brief learners and discuss with them how to present their data to ensure it is fit for purpose.
- Ask learners to choose their method for data presentation.

Learning aim D – Review the vocational investigative project using correct scientific principles

- You should introduce the topic of how to write scientific reports and cover scientific protocol and terminology. You would also need to brief learners about structure and format, use of past tense, and the use of correct scientific terminology, referencing and bibliography.
- Ask learners to write up their reports ensuring they have drawn conclusions, used the correct format, reflecting on their outcomes and discussing any limitations and improvements that could be made.
- Ask learners to present their project findings.



Details of links to other BTEC units and qualifications, and to other relevant units/qualifications

Units in the new Level 3 BTEC Applied Science qualification that link to this unit are listed below.

- *Unit 2: Practical Scientific Procedures and Techniques*
- *Unit 3: Investigative Skills*

The previous QCF Level 3 BTEC National in Applied Science also has units that link to this unit and resources produced or purchased for those units may be suitable for use in this unit.

Resources

In addition to the resources listed below, publishers are likely to produce Pearson-endorsed textbooks that support this unit of the BTEC Nationals in Art and Design. Check the Pearson website (<http://qualifications.pearson.com/endorsed-resources>) for more information as titles achieve endorsement.

Textbooks

Foal, S, Hocking, S, Llewelyn, R, Musa, I, Patrick, E, Rhodes, P and Sorenson, *BTEC Level 3 Applied Science Student Book*, Pearson, 2010, ISBN: 9781846706800

Contains Unit 3 Scientific Investigation material for 2010 specification.

Coyne, G S *The Laboratory Companion: A Practical Guide to Materials, Equipment and Techniques*, John Wiley and Sons, 2005 ISBN: 9780471780861
Contains information about material, equipment and techniques.

Journals

Nature

New Scientist

Scientific American

Websites

www.ase.org.uk/

Association for Science Education

www.HSE.gov.uk/coshh/

Control of Substances Hazardous to Health

www.HSE.gov.uk

Health and Safety Executive

www.iop.org/

Institute of Physics

www.nationalstemcentre.org.uk/

National STEM centre

www.rsb.org.uk/

Royal Society of Biology



<http://www.rsc.org/>

Royal Society of Chemistry

www.stemnet.org.uk/ambassadors/

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