Level 3 - Principal Learning
Engineering (ENG3U7)

SAMPLE ASSIGNMENT BRIEF

UNIT 7: INNOVATIVE DESIGN AND ENTERPRISE

This example assignment has been developed by AQA-City & Guilds as part of a QCDA funded project and has been reviewed by practitioners, representatives of sector and awarding organisations and QCDA.

Engineering Diploma
Level 3 Unit 7: Innovative Design and Enterprise (ENG3U7)

Sample Assignment Brief
(Approximately 10 hours under controlled conditions)

Please find below an example of an assignment that could be used for this unit of the Engineering Diploma. It must not be assumed that this assignment will be guaranteed to meet the precise needs of all consortia, but it could be used as a basis.

Learner Brief

In this assignment, you have been approached by a company who are considering developing an innovative design of wind power generator for domestic (home) use. They have asked you to act as a consultant and advise them on the commercial viability of the potential product. You should select a possible design and evaluate its commercial potential for the home-use market.

The time allowed for this assignment is approximately 12 hours.

Background

It has been widely suggested that wind power will find increasing use to help meet future energy needs in the United Kingdom. Most current wind power systems are based on Horizontal Axis Wind Turbine (HAWT) designs. These designs use a propeller-like series of rotor blades which need to face the wind, like a traditional windmill. Although HAWT products for use in the home environment are commercially available, their take-up has been limited.

Over the last ten years there has been significant development in Vertical Axis Wind Turbines (VAWT), with innovative designs such as the Gorlov helical turbine, giromill and new variations of the Savonius wind turbine. These designs are claimed to offer several potential advantages over HAWT designs for domestic applications. Pictures and explanations of these designs can be found at http://en.wikipedia.org/wiki/Wind_turbine.

Task To Be Carried Out

Task 1: The Proposed Product

(estimated time allowed: 4 hours)

Select one of the following VAWT designs:

- Gorlov helical turbine
- Giromill
- Savonius.

Using the internet and a variety of other sources (e.g. libraries), carry out research to identify:

- applications where this design is already in use
- other applications for which this design may be suitable
- the needs of the current and potential users
- the performance of your chosen design, including power generation, equipment cost, operating cost, reliability and the social and environmental impacts
- the materials and manufacturing processes used to make the product
- whether there is any existing protection for this design or whether it may be possible to obtain design protection for the new product.
- how the product will be disposed of at the end of its usable product life.

Task 2: Bringing the Product to Market

(estimated time allowed: 2 hours)

Using the internet and a variety of other sources (e.g. libraries), carry out research to identify:

- a forecast of energy demand and the reasons why new sources of energy are required
- what the commercial demand would be for domestic (home) use
- how leadership affected the product development process of examples produced previously
- how similar products have been brought to market.

Task 3: Report

(estimated time allowed: 6 hours)

Write a report evaluating the commercial viability of the design that you have chosen for the domestic (home-use) market. This should summarise your research and include:

- details on existing and potential applications of this design
- a detailed analysis of your chosen design, including:
    - design considerations
    - cost
    - performance
    - reliability and possible causes of failure
    - social and environmental impacts
- how well the design would meet the needs of the potential users
- a detailed review of considerations needed prior to taking the design to market, such as:
    - the role of leadership during the product development process
    - the protection of ideas
    - materials and manufacturing constraints
    - the potential for recycling at the end of the usable product life

- a forecast of the commercial demand, including the reasons for this demand
- a description of how similar products have been brought to market
- a development plan for bringing this design to market
- final conclusions and recommendations on the commercial viability.

Evidence Needed

You must provide the following evidence for this assignment:

A report on the commercial viability of an innovative design of wind power generator, which includes:

- using information and data from a variety of sources to provide details about the technology, commercial applications, and design protection, reliability and possible causes of failure. This should include a list showing the variety of sources used (approximately 40% of the total mark)
- a consideration of environmental factors, showing awareness of energy issues and product disposal (approximately 25% of the total mark)
- a description of how existing products have been brought to market and a plan of development for this product, including market research and demand (approximately 35% of the total mark).

Additional Commentary for Teachers

This assignment has been designed as a stand alone task for this unit. It involves the learner preparing a report that assesses in detail the commercial viability of an innovative product.

This assignment is a suggestion of one of the possible ways of addressing the assessment needs for this unit. It is possible to use an alternative context or product, provided that the evidence requirements and assessment criteria are met. If a suitable alternative product (i.e. that allows the assessment criteria to be met, such as an alternative ways of powering generators) is identified, this could be directly substituted for the wind power generator in the above tasks, whilst retaining the items of evidence that need to be covered in the report.

Context and Launching the Assignment

This type of activity is often carried out by consultancies or within the product development areas of commercial companies. It may assist understanding if prior to the assignment the students visit an example of this type of company, if possible tracking the development of a product.

Alternatively, to set a specific context for the technology, depending upon local availability it may be possible to visit either a wind farm, which could provide a useful insight into reliability and maintenance requirements on a larger scale, or a company that manufactures small wind power generators. It should also be noted that small HAWT wind power generators are available from a wide variety of commercial outlets, including many of the larger branches of the national DIY chains.

Managing the Experience

General Guidance

The research information that the learners need to locate is indicated in the bullet points. It should be emphasised that this needs to focus on the domestic (home-use) market – if this extends into more general applications, then it is likely that time will be spent gathering superfluous information. Teachers and tutors should note that other comparable products that offer a suitable level of challenge are available: consortia will be best placed to decide as to what is appropriate for their learners, but may seek the advice of their moderator if they would like further guidance upon this area.

It is important that once a design has been selected, the learner maintains it as their focus – it is equally valid if they establish that a design is either viable or non-viable, so long as they can justify their conclusions. If they switch between different designs this may mean that some of the research time already used is no longer relevant, which could limit the level of detail and understanding which they achieve.

When considering the performance and characteristics of the design and its commercial viability, learners should compare it to the potential competition. This could include, for example, the alternative VAWT or HAWT designs, alternative approaches such as solar power, bio-fuel generators, fuel cells, or mixed approaches.

It may be helpful to provide a template for the format of the report in Task 3.

Task Sequence and Opportunities for the Segregated Release of Tasks
Although Tasks 1 and 2 are not directly assessed, they are essential for the successful completion of the assessed report and need to be carried out before Task 3.

Some segregation of tasks is possible – i.e. it is not necessary to proceed directly from Task 1 to 2 to 3. For example, Task 1 could be carried out following the learning of assessment criteria 1a, 2b, 2c, 2d, 3a, 3c, 4a and 4b in the specification. The learners could then study assessment criteria 1b, 2a and 3b before carrying out Task 2. The learners could then study the remaining assessment criteria before carrying out Task 3. If this form of segregation is followed, rather than provide the full brief at the start of the assessment activity, the learners could be provided with the instructions for individual tasks as they are carried out. This will avoid time issues where learners may otherwise work on parts of the assignment during the intervening times. The teacher / tutor needs to ensure adherence to the total time allowance, as explained in the section titled ‘Level of Control’, below.

Resource Control
The primary resource needed to support this activity will be access to the internet. Access would need to be controlled within the time constraints indicated.

Team (Collaborative) Working
Collaborative working is feasible in Tasks 1 and 2.

In Task 1, learners could collaborate by dividing the different areas of research between a team, with each then reporting their findings to the team. Learners could also do this in Task 2, where there is also the opportunity for individuals to study different products being brought to market in detail, then to share their findings with their team. These tasks should be limited to information gathering.

Task 3 should be carried out independently and will provide the evidence for the assessment. Compared to the data gathering activities in Tasks 1 and 2, in Task 3 learners must use and interpret the data.

Level of Control
This assignment must be carried out with controlled assessment:

- The level of control during task setting (i.e. stating the brief and the tasks to be carried out) is limited. This means that consortia can adapt or contextualise this assignment, or invent their own assignment, so long as it continues to have a clear purpose and to satisfy the requirements in the specification. This allows consortia flexibility to accommodate for the different availability of materials and manufacturing resources.
- The level of control during task taking for all three tasks will be medium. This means that the students are not under exam conditions, but that the teacher or another appropriate person will be present during the work. The teacher should ensure that the total time allowed for the assignment is controlled to 12 hours +/- 10%. Where some work may be carried out as a collaborative effort (for example, dividing some of the research activities, as outlined above),

the teacher must ensure that the report submitted for assessment is the student's independent work.
- The level of control during task marking will be medium. This means that after the teacher has marked the work, it will be moderated by the awarding body.

Links to Other Units
This activity could be linked to Unit 1, where environmental implications are considered in detail and the business case and project management aspects could focus on the development of the new product.

Links to PLTs
This task provides the opportunity to demonstrate:
- Independent Enquirers – by identifying the questions to be answered and planning and carrying out research
- Creative Thinkers – by exploring the design possibilities and evaluating alternative ideas
- Reflective Learners – through reviewing progress, taking account of feedback and communicating their learning appropriately
- Team Workers – by co-operating with others if research activities are carried out as a group activity
- Self-Managers – by organising their time and resources to complete the task to schedule
- Effective Participators – by breaking the task down into manageable steps, identifying improvements that could benefit others and trying to influence the views of others through their report

Differentiation, Diversity and Inclusion
This assignment was reviewed to identify whether any of the competences required by the subject presented a potential barrier to any candidates regardless of their ethnic origin, religion, gender, age, disability or sexual orientation. If this was the case, the situation was reviewed again to ensure such competences were included only where essential to the subject. Similar considerations must be applied when making any amendments to the context and tasks in alternative assignments.

As these assignments are formally assessed, for learners that do not have special needs the main form of differentiation should be by output (i.e. the standard and level of detail in the work produced).

Access arrangements and reasonable adjustments can be made for disabled candidates in order to enable them to access the assessments - for example, the awarding body can produce a Braille paper for a candidate with a visual impairment. These arrangements must be made before the assessment and should be agreed with the awarding body. For this reason, no learners should have a barrier to any part of the assessment.

The provisions of the Disability Discrimination Act (DDA) 1995 were taken note of in developing this assignment and should be considered when making any amendments to the context and tasks in alternative assignments. The Exam Board follow the guidelines in the Joint Council for Qualifications (JCQ) document: '*Regulations and Guidance Relating to Candidates who are Eligible for Adjustments in Examination GCSE, GCE, AEA, Entry Level, Basic Skills & Key Skills. Access Arrangements and Special Consideration'*. This is published on the JCQ website (http://www.jcq.org.uk/access_arrangements/) or you can follow the link from the Exam Board website (http://www.aqa.org.uk/admin/p_special_3.html).

Conformance with the Assessment Grid

Marking of this assignment is determined by completion of the assessment grid. All three areas of the assessment criteria are covered by the report in Task 3.

Assessment criteria topic	**Band 1**	**Band 2**	**Band 3**	**Principle location of evidence in the report:**
	The learner has:			
	0 to 5 marks	6 to 10 marks	11 to 15 marks	
1 Engineering innovation and new technologies	Relied predominantly on a single source of information to produce the report.	Collected and used information from a variety of sources when compiling the report.	Produced a report which conveys detailed information, drawn from accurate analysis and used data drawn from a wide variety of sources.	List of the sources used in the report. References in main body of project to sources used.
	Described the contribution of an entrepreneur, or evaluated an innovation, in simple terms.	Described the process of bringing an idea to market with some detail, using an existing product or entrepreneur as an example.	Evaluated the contribution that a successful entrepreneur or product has made, including generating profit from ideas and the effect of market competition.	Details on existing applications and description of how similar products have been brought to market.
	Produced a description which contains a limited examination of the emerging technology or design.	Produced an account which includes most of the essential information about emerging technology or design.	Produced a well-documented and easy to follow account which provides a detailed account of the emerging technology or design.	Details on existing and potential applications and analysis of the design
	Provided limited evidence of analysis and data use.	Undertaken adequate analysis and data use to justify decisions or suggestions.	Included in-depth analysis and significant data use; offered substantiated conclusions that are drawn from accurate analysis.	Performance criteria and market forecasts, justification of recommendations
	0 to 5 marks	6 to 10 marks	11 to 15 marks	
2 Engineering opportunities and the protection of ideas	Produced a few suggestions which have limited potential and which need more development to be considered useful.	Identified a clear opportunity and suggested a plan of development.	Looked at several possibilities, compared or combined technologies to provide the basis of a potential commercial development.	Analysis of the design and development plan for bringing the product to market
	Described how information obtained from limited sources could be used.	Suggested methods of researching to meet the level of technical or commercial demand.	Related market research to possible demand.	Forecast of the commercial demand, including the reasons for this demand
	Discussed possible causes of failure.	Evaluated the potential level of reliability and possible causes of failure.	Explained how the competing factors of concept, manufacturing constraints, reliability and cost can be accomplished.	Review of design considerations (materials and manufacturing constraints)
	Included references to methods of ideas protection.	Made explicit references to how protection methods would apply.	Identified those aspects which would need protection, and identified methods of adequately protecting ideas.	Review of design considerations (design protection)
	Suggested a commercial application in the proposal.	Shown a clear understanding of the important commercial considerations, including organisational behaviour.	Produced a realistic proposal, and considered strategies which would add viability to the project.	Development plan for bringing the product to market
	0 to 5 marks	6 to 10 marks	11 to 15 marks	

3 Developing engineering ideas and design	Considered some constraints related to developing an idea or technology.	Considered a range of issues and proposals related to the commercial development of an idea or technology.	Considered several options with sufficient depth to justify any decisions or recommendations made in relation to the commercial development of an idea or technology.	Analysis of the chosen design
	Explained the role of leadership in design development.	Used examples to illustrate how leadership has affected the design development process.	Actively taken a leadership role when developing design ideas and fully explained the role of leadership.	Description of how similar products have been brought to market
	Shown restricted evidence of design thinking.	Used research and objective reasoning as a basis for decisions reached and presented in a range of designs; assessed energy requirements.	Related market research to possible demand; clearly considered manufacturing and cost constraints and presented in a good range of designs; assessed any impact on people's lives, including visual appearance.	Analysis of design and review of considerations needed prior to taking the design to market
	Produced limited recording or evidence of problem solving.	Recorded and problem-solved as an integral part of the process.	Recorded thoroughly and used a range of problem-solving techniques to provide well-communicated possible solutions.	Analysis of design and review of considerations needed prior to taking the design to market
	0 to 5 marks	6 to 10 marks	11 to 15 marks	
4 Environmental issues relating to engineering design	Considered a number of environmental design issues at a simplistic level.	Considered most environmental factors both when designing and when assessing any longer term impact.	Considered a wide range of environmental factors; included an analysis of impact and disposal, and any impact on social behaviour or the environment.	Analysis of design: social and environmental impacts
	Discussed the use of energy and materials.	Shown a good awareness of energy issues and materials.	Produced a thorough and detailed analysis of energy and material requirements and costs.	Analysis of design: social and environmental impacts and review of considerations: materials and manufacturing issues
	Described problems of disposal.	Considered aspects such as changes in social behaviour or material use or disposal.	Described in detail the life-cycle of the product or system.	Review of considerations prior to taking the product to market: potential for recycling