VCE Systems Engineering Unit 1

**Design Brief Example**

**Project:** Gravity Lamp

(Why?)

**Problem:**

Many children in developing nations lack access to basic educational opportunities, some are lucky to make it to school at all and the chance to practice and review content learnt at school can be very challenging, especially in homes that are not connected to electricity for proper lighting. Candles and oil lamps are sometimes used but these create unsafe fumes inside a house that impacts on the health of children especially, causing a range of respiratory diseases. Education is seen as the key to lifting these children out of poverty and the prospect of a better future.

**Need:**

A development organisation has contacted me to help come up with some ideas to prototype a device that can create a consistent light source for around reasonable period of time before resetting is required. The lighting device must work without the use of an electrical source to help communities that don’t have access to power. The aim is to assist children in completing their homework by supplying adequate light, which is simple to use and install, environmentally sustainable and scalable.

(Who?)

**Client:**

‘Light up Education Foundation’ is a non-profit organisation working to overcome the barriers to the worlds disadvantaged children from getting a good education to lift their prospects for a brighter future. They have recently formed off the back of a very successful ‘Go fund me’ campaign in the last six months. They look to launch their first program in Papua New Guinea at the end of the year, with a need to come up with a well-tested and manufactured device.

**End user:**

The lighting device would be used by a range of households in developing nations that do not have access to electrical power either from the grid or battery backup. Typically, these households would be in remote villages or on the outskirts of larger townships. Surveying nearby schools would help to determine household priorities and needs.

(What?)

Constraints:

* The cost of each device would need to be less than $20 AU.
* A prototype would need to be developed by September for foundation’s appraisal.
* Minimum lighting time needs to be at least 20 minutes
* Non - polluting when in use; no fumes released
* Safe to use; strain and injury minimisation
* Low maintenance

Considerations:

* A simple design for easy manufacturing
* Light weight for transport
* Minimal maintenance, long life
* Easy to construct
* Cost effective light type
* Use of recycled materials for sustainable construction
* Easy to operate

(How?)

Potential Tests:

* Light run time Test: This will test how long the light can last from a reset. It will be repeated a number of time to test consistency and to find a reliable average time it can last for. This test will highlight any areas of the system that cause inconsistencies such as points of friction, poor design and maintenance needs.
* Effective Area Lighting Test: This will test the area that is effectively lit for use with reading and writing at a safe level to prevent eye strain. It will also look at any light flicker from uneven power deliver to the light. This test will highlight any problems with the charge generating mechanism and the appropriateness of the light used.
* Ease of use Test: This will test the ability of an operator to use the system. This refers to the location and adjustment of the light, the resetting and running of the mechanism. This test will highlight any health risks due to strain or injury to the operator.
* Wear and tear Test: This test will be a run over a long period of time to see what issues arise due to prolonged use. It will highlight what maintenance areas may need design improvement.

Initial Research:

* Suitable light types, their efficiencies and relative costs.
* DC generator types, costs and performance.
* Force multiplication and mechanical advantage of gear ratios
* Materials suitable for mechanism construction; strength, cost, longevity, etc.