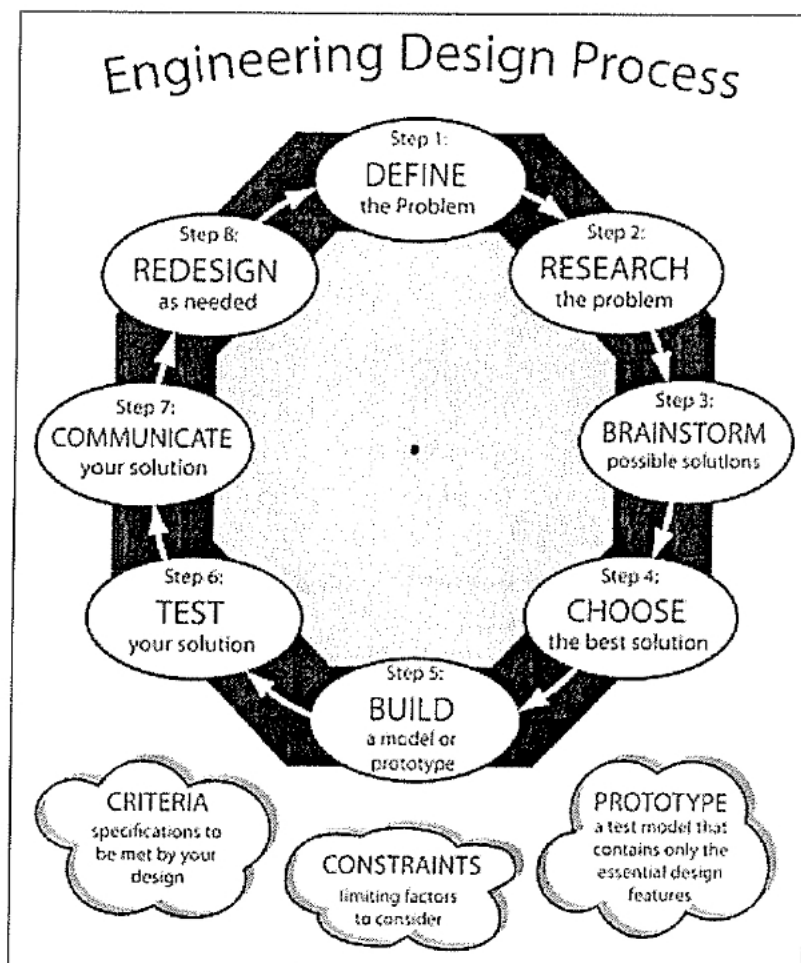


Year 9 STEM unit: Biofuels

Rationale: In this unit, students will be challenged to power a putt putt (pop pop) boat with the most efficient biofuel and rate its performance against conventional fuels.

The steps in the Engineering Design Process will be used as a framework and guide by the students to firstly tap into prior knowledge/learning and secondly to identify what they need to learn in order to meet the challenge, make the fuel and the putt putt boat and test and report on the efficiencies of the tested fuels.



Course structure: this unit is run over a term in 2 x 70 minute lessons per week.

Students will require access to a laboratory to make the biofuel and will need to be taught soldering in order to make the putt putt boat. (Alternatively, a tranguia could be used to evaluate the fuels efficiency.)

Small amounts of fuel will be burnt – appropriate risk assessment and management needs to be undertaken by the students

Step 3: Brainstorm possible solutions

- What biofuels should be made?
- What measures of energy efficiency will be measured?
- How will the data be ranked in order to evaluate the “best” biofuel?
- Which heat energy efficiency machines should be used- boats, heat energy device, Trangia (also ties in with GOALS program and Yr 9 camp where the students use Trangias to cook a meal)

Step 4: Choose the best solution

Come to a class consensus re above

May need to refine knowledge once the best solutions have been agreed upon. For example if the class decide to make biofuel from sunflower, rice bran, peanut and vegetable oil the chemical structures and properties of those particular oils need to be known.

Step 5: Build model/prototype

Two stages:

Stage 1- Transesterification experiment to produce the 4-5 different biofuels (see attached)

Stage 2- Construct the putt putt boats

Step 6: Test your solution

Measures on the fuels can be gathered using contacts through tertiary institutions. TGSHS is currently involved with QUTs Step-Up program in which students visit the university on two occasions to gain access to equipment that is unavailable in a high school setting.

These include:

Samples placed in a bomb calorimeter- energy reading

Viscosity testing

FTIR- molecular spectroscopy technique, chemical analysis method that shows the bonding present in a sample

Testing at school- biofuel sample placed in a putt putt boat or another heat energy device.