Working Document

OVERVIEW OF THE TASK

Concrete

Target audience:	2nd cycle of secondary school (4th year) AST (with option)
Team or individual work:	2 people
Class time required:	8 - 75 minute periods

Educational Aim:
This learning situation will allow the student to understand the scientific and technological principles used in building concrete structures. The student must come to understand the concepts of constraints and characterisations of mechanical properties. The situation puts the student in a context where he has to design and build concrete beams for a civil engineering construction firm. The student will thus be better able to outline his personal and professional fields of interest.

NOTE: This LES was designed within the framework of teacher training sessions. It will require adaptation before being used with students.

Targeted disciplinary competencies:
C 1 Seeks answers or solutions to scientific or technological problems
C 3 Communicates in the languages used in science and technology

Targeted cross-curricular competencies:
C_t-2 Solves problems

Broad Area of Learning	**Orientation and entrepreneurship** Axes of development: self-knowledge and awareness of one's potential and how to fulfill it (awareness of his fields of interest and of his professional aspirations).

Involved worlds and compulsory concept(s) N.B. The concepts written in italics are seen in the optional course.	**Material World:** *Physical properties of solutions* • *Solubility* • *Concentration* • *pH scale* *Physical transformations* • *Dissolution* • *Phase changes* Chemical transformations • Oxidation • *Balancing chemical equations (concrete curing)* • *Law of conservation of mass (concrete curing)* • *Exothermic reactions (concrete curing)* • *Reaction speed (in relation to temperature)* Energy transformation • Distinction between heat and temperature

Involved worlds and compulsory concept(s) N.B. The concepts written in italics are seen in the optional course.	Fluids • Archimedes' principle • Pascal's principle Forces and movements • Gravitational force • Balance between two forces • Mass and weight **Technological World:** Language of lines • Standards and representations (diagrams, symbols) • Functional dimensioning • Multi-view orthogonal projections Mechanical engineering • Adhesion and friction between parts • Materials • Constraints (flexion, shearing, traction, compression) • Characterisation of mechanical properties • Thermal treatments (steel) • Types and properties (plastics, composite materials) • Modification of properties (deterioration, protection) Fabrication • Measurement and control, form and position **Earth and space :** Lithosphere • Minerals (silicate, aluminates, granulates, carbon, steel, steel pyrite …)
Community resources	In a developed country with so much water, bridges and overpasses have long since been a part of the landscape. In addition, the recent collapse of the « de la Concorde » overpass should motivate the student for this LES.
Possible evaluation: « To be determined »	
Global Context: Each team must design a concrete beam while respecting the constraints set out in the specifications book. The team will be allowed some latitude as to the selection of certain parameters: • The choice of proportions between different concrete granulates • The choice of the positioning of the internal framework making up the reinforced concrete of the beam • The shape of the beam, while respecting the norms stipulated in the specifications book Finally, each team submits their beam to a destructive test which will determine how many times the beam can support its own weight. This test is the ideal occasion to organize a friendly competition.	