1. Target Audience

Class: ENES120, Statics
Students: First-year engineering students

2. Curriculum Element Goals

a. Established Goals
   i. HCC initiative: oral presentations in STEM curriculum
   ii. Personal initiative: Design across the engineering curriculum
   iii. Course objectives:
       1. Sketch the free-body diagram of a rigid body in equilibrium.
       2. Solve for unknown forces acting on a rigid body.
       3. Determine the forces in members of a simple truss.
       4. Determine the forces in members of frames and machines.

b. Understandings
   i. Eng design requires both creativity and technical/analytical ability.
   ii. Design problems have many valid solutions.
   iii. Uncertainty and assumptions are key elements of eng design.

c. Essential Questions
   i. How does an engineer generate design concepts and compare/evaluate concepts?
   ii. How is structural analysis used to justify a design concept?
   iii. What uncertainties are faced in realistic problems?
   iv. What is a “reasonable” assumption? Unreasonable?

d. Students will know...
   i. the steps in the structural design process
   ii. the important role of requirements in eng design

e. Students will be able to...work effectively in teams to...
   i. generate and compare design concepts
   ii. perform structural analysis, using statics principles
   iii. communicate technical justification, both written and orally

3. Curriculum Element Description

The curriculum element designed to meet the above goals is a structural design project, to be completed in teams of 2-4 students. Students are given 6-7 weeks to design a truss bridge to satisfy requirements and constraints specified by the assignment. Student teams function as engineering design firms responding to an RFP from a railroad company. The railroad needs a
bridge to span a ravine (site drawing is provided to students). Students work with their team, and compete with other teams, to design a bridge that is structurally sound, statically determinate, and cost-effective. Each team develops a structural analysis report and presents their final design at the end of the project.

For more details, see the assignment (separate document).