

Lesson Plan: Problem Solving for Sustainable Engineering Suggested Time: 50 minutes Overview

John V Maes

***Corresponding author**

John V Maes

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Through competition and collaboration, students will learn about and then employ problem solving strategies to create solutions in the field of sustainable engineering.

Necessary Vocabulary

- Bioaccumulation
- Sustainability
- Structural engineering
- Footprint
- Electrical engineering
- Estuary
- Benzene
- Power systems
- Boring (soil boring)
- Biotransformation
- Hazard protection
- Transportation
- Criteria Pollutants
- Project Management
- Energy efficiency
- Intelligent buildings

Objectives

- Students will learn about and apply collaborative problem-solving methods.
- Students will engage in critical thinking skills and will test their own abilities and
- Students will practice resiliency in the face of design and implementation

Project Materials Required

- Scrap materials: Popsicle sticks, skewers, textiles, Styrofoam, etc.
- Tape, glue, string, and other binding agents

Multimedia Resources

- Neef Educational Resources: <https://www.neefusa.org/resource/>

hands-land-educator-toolkit* “Architectural Engineering.” Kids’ Net Encyclopaedia. [http://encyclopedia.kids.net.au/page/ar/Architectural engineering](http://encyclopedia.kids.net.au/page/ar/Architectural%20engineering)

- Salvadori, Mario et.al. The Art of Construction: Projects and Principles for Beginning Engineers and Architects. <http://amzn.com/1556520808>
- Before the Lesson/ Background Information
- Assemble a plethora of scrap materials for building improvisation (ensure there is diversity in these materials; plastic bottles, foam core, wood, and aluminium are all strong choices).
- Read through these materials on sustainable engineering projects for students: <https://www.neefusa.org/resource/engineering-sustainable-world-educator-toolkit>

The Lesson

Part 1: Competition (25 mins)

- Separate the class into two groups: students who prefer to be “sustainability experts” will all work together in one group, and “engineer” types will work together in the other. You will likely have uneven groups, and this is fine (i.e., more engineers than sustainability experts).
- Using the materials you provide, the groups will compete to build a structure.
- Make it clear that you will evaluate their structures based on the following criteria:
 - Structural Stability
 - Sustainability
 - Functionality and utility
 - Accessibility
 - Originality
- Groups will have 25 minutes to design and complete a small structure using the materials Provided. This will also include a breakdown of the footprint that each material used will cause to the environment.

Part 2: Collaboration (25 mins)

- a. This time, create groups made up of a mix of engineers and sustainability experts. Ensure that, regardless of the number of engineers or sustainability experts, each group has at least one of each type.
- b. Hold the competition again.
- c. Compare the second round of structures to the first. What changed? What worked better/worse? Why?

Part 3: Discussion (10 mins)

- a. Discuss the differing results with your students. What led to these results? What are the takeaways?

- b. What were the different styles that groups used to manage problem-solving and designing their structures?
- c. Why do engineers need sustainability experts? What is the overlap, and how does it ensure for better buildings and a better future?

Homework

Assign a one-page reflection where students analyse the way in which their groups worked, what they would change, and what the value is of environmentally conscious engineering. Have the students turn this in next class.

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