Understanding By Design

Title: Engineering Communication
Standards:
Standard #8: Students will develop an understanding of the attributes of design.

- The design process includes defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.
- Design problems are seldom presented in a clearly defined form.

Standard #9: Students will develop an understanding of engineering design.

- [9.K] A prototype is a working model used to test a design concept by making actual observations and necessary adjustments.
- [9.L] The process of engineering design takes into account a number of factors.

Standard #11: Students will develop abilities to apply the design process.

- [11.M] Identify the design problem to solve and decide whether or not to address it.
- [11.N] Identify criteria and constraints and determine how these will affect the design process.
- [11.O] Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product.
- [11.P] Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check the proper design and note areas where improvements are needed.
- [11.Q] Develop and produce a product or system using a design process.
- [11.R] Evaluate final solutions and communicate observation, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to the three-dimensional models.

Stage 1: Desired Results

Understandings

Students will understand…

- The basic communication skills needed by engineers
- How mathematics play a role in engineering
- How to create technical drawings in 2-D & 3D methods
- How to use technical drawings with the engineering design process to create a technological product

Essential Questions	Knowledge & Skill
♦ How does the creation of individual solutions to technological problems lead to a changed world and changes in our daily lives? ♦ How will an understanding of engineering design lead to a better	♦ Explain & Use the Engineering Design process ♦ Compare & contrast Engineering Education & Technological Literacy ♦

understanding of my world? ♦ What can I take from the engineering design process to create a more successful future?	

Stage 2: Assessment Evidence

Performance Task Summary	Rubric Titles
♦ Rube Goldberg Machine	♦ Rube Goldberg Rubric

Self-Assessments	Other Evidence, Summarized
♦ Check each section of project against rubric	♦ Labs to explore simple machines

Stage 3: Learning Activities

- Where: Introduce essential questions & discuss pre-established knowledge
- Hook: How does engineering impact our world? Watch video & discuss
- Explore & Equip: Complete PowerPoints & Discussions in part 1 & 2.
- Rethink & Revise: Complete labs to help create a viable solution
- Evaluate Understandings: Rube Goldberg Machine Project
- Tailor: Students select materials and simple machines
- Organize & Sequence:

  Day 1: Engineering Design Process
  Day 2: Engineering Education & Technological Literacy
  Day 3: Challenge Introduction
  Day 4 - 5: Labs
  Day 6 -11: Rube Goldberg Machine Project
  Day 12: Rube Goldberg Machine Testing