

Research Experiences for Teachers (RET) – 2014

LESSON PLAN TEMPLATE

MODULE TOPIC: Engineering Design Method Challenges

OBJECTIVE(S): Students will be able to:

- Create a small working device powered by the potential energy in elastics by applying the engineering design method.
- Document their work in an engineering notebook.

STANDARD(S) & INDICATOR(S):

NGSS:

HS-PS3-3. Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

MATERIALS:

- engineering notebooks,
- instructions
- ziploc bag containing, 2 paper clips, 2 plastic straws, 2 popsicle sticks, 1 plastic cup, 2 standard size elastics, one small 6 inch propeller with a hook mount for the elastics. Tape for fastening.

LIST OF HANDOUTS (attach original copies of each handout - teacher & student edition)

1 handout with student instructions - teacher notes include grading rubric

CLASSROOM ACTIVITY DESCRIPTION (LABORATORY/EXERCISES/PROBLEMS)
including detailed procedures:

Students will design, build, and test a small "vehicle" powered by elastic bands and a small propeller. Students will document their process and in an engineering notebook.

- 1) Students form groups of 2 - 3 students and review the build instructions, constraints and materials.
- 2) Students brainstorm ideas and document their 3 best ideas, selecting one for a prototype
- 3) Students build the prototype using only the materials supplied, and test it by "driving" down a table top. A good design will travel in a straight line at a steady speed once started.
- 4) Students record all design and trial data in their engineering notebooks.

SAMPLE QUESTIONS TO ELICIT CLASS DISCUSSION:

The teacher will review the concept of constraints in engineering design and challenge students to think carefully about the function of each of the materials in their design

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HOMEWORK ACTIVITY/EXERCISES/PROBLEMS:

Preparation includes review of engineering design method

PARAMETERS TO EVALUATE STUDENT WORK PRODUCTS:

Does the device work as designed? Are ideas, designs and trial data recorded properly in the engineering notebook?

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