Fifty percent of students entering engineering programs do not earn an engineering degree. Many students leave engineering because unsatisfactory experiences in introductory engineering courses in their first and second years. Improving student engagement through the use of everyday examples is one key E3 strategy to engage students and retain them in engineering. This project implemented E3s in Engineering Examples (E’s) in four engineering courses to teach technical concepts through E3s and E3 mini-grant. This paper introduces E3s in four engineering courses and shares the benefits of E3s and the experiences and strategy of using E’s examples in engineering classes.

**E’s Examples in ENGR 111 Introduction to Engineering**

**Cellular Telephone System Design**
- Teach engineering design process in a hands on manner to ENG 111 students.
- Apply computer tools such as WWW, Excel and Word to create the design.
- Steps involved in the process:
  - Problem definition
  - Problem Evaluation
  - Problem Solution
  - Communication

**Problem and Solution**
- Cellphone area of coverage: 329 square miles
- Structures over 30 ft now allowed in the city
- Non overlapping hexagonal cells used
- Radius of typical cell = 5 Km
- To do:
  - Discuss of how to place antennas to address the political difficulties
  - Discussion of how many cells will be needed
  - A map of cell locations with antenna locations indicated

**E’s Examples in MEEG 223 Materials Science for Engineers**

**Structure-Properties-Processing**
- Bobby pin experiments
  - Experiment 1: Bend and not break
  - Experiment 2: Heat it in propane flame, then quench in water, bend and break
  - Experiment 3: Reheat bobby pin in candle flame, cooled in air to room temperature, bend and not break

**Polymer Structures and Properties**
- Regular-size spaghetti vs chopped-up spaghetti
  - Molecular weight and properties
  - Copper wires vs licorice sticks
  - Structure and properties

**E’s Examples in CPEG 210/315 Digital Systems I/II**

**Seven Segment Decoders**
- For Freshman/Sophomore Computer Science and Engineering
- Topics:
  - Digital Design of Combinational Logic
  - Activity:
    - Explore the seven segments of the LCD display
    - Design and simplify the Logic of each segment
    - Connect the derived logic to turn on/off LEDs in a 7-segment display

**Alarm Clock Design**
- For Sophomore and early Junior in Computer Engineering
- Topics:
  - Digital Design of Combinational and Sequential Logic
  - Activity:
    - Input, outputs and alarm time, alarm enable, alarm buzzer
    - Find the sequence of logic leading to the design and implement using discrete logic gates
    - Implementation can be programmed on an FPGA

**Outcomes of using E3s Examples in the Four Classes**
- Students have been found to be more engaged in class. They ask for more questions and actively participated in discussions.
- Students have been more enthusiastic to learn when we relate the engineering concept to real everyday engineering examples.
- Students have been found to be more apt to continue a course of study if the work involves subjects and activities that interest them.
- Students are also encouraged to use of critical thinking in the everyday engineering examples.

---

**UB E3s Mini-Grant**

School of Engineering at the University of Bridgeport was among ten engineering schools selected in February 2013 to receive a E’s mini-grant to implement Everyday Examples in Engineering in their classes. This project implemented E3s in Engineering (E’s) program in four engineering courses:
1. ENG 111 Introduction to Engineering in Fall 2013 by Dr. Navarun Gupta.
2. MEEG 223 Material Science for Engineers in Spring 2013 and Spring 2014 by Dr. Junling Hu.
4. CPEG 315 Digital Systems II in Fall 2013 by Dr. Md Faezipour.