

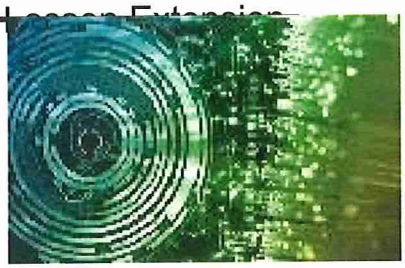

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| **Teacher Name(s):** | **Lynn Petkewich** |
| **School and District:** | **Lynn Classical High School / Lynn Public Schools** |
| **Course:** | **Pre-Engineering Drawing** |

**Abstract:** In 200 words or less, please provide a summary of the goal for the lesson extension and its relationship between industry and academic topic.

**Engineering/Technology Link:**

1. How did you *introduce* engineering/ technology concepts or the company/industry focus in your course? Check the appropriate box(es) or choose Other.

   ▫ Defined terms (science, engineering, technology)

   X Described the engineering design process

   X Engineering design challenge related to industry

   ▫ Overview of the company

   ▫ Challenge based on 'industry specific' area of focus (manufacturing process, quality control, measurement, development, teamwork etc.)

   ▫ Other: _____

**Level of Inquiry**: Which of the following best describes the level of inquiry (adapted from Bell 2005) you used for this lesson/unit? Check the appropriate level.

□ *Structured inquiry*: Instructor provides question and procedure. Students determine the results based on given procedures.
☒ *Guided inquiry*: Instructor provides question. Students design procedure and determine the results.
□ *Open inquiry*: Students investigate their own research question. Students design procedures and implement the procedure on their own.

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| **~~Student Assessment:~~**<br>**Students thought the project was fun.** |
| **Delivery Assessment:**<br>**The creativity of the students was amazing.** |

**Additional resources and assessments:** Attachments should include handouts, readings (with references), lab write-ups, rubrics, exams/quizzes, and/or other similar materials.

**Description:**
This project in the Pre-Engineering & Drawing course relates to the GE Aviation industry in that the software the students use to draw their prototype and the process the students follow, are similar to the CAD software and the design process used at GE Aviation [Design, Manufacture, Assembly/Test, Flight Service Center, Program Management, Customer Support].

As with GE, engineering design involves practical problem solving, research, development, and invention/innovation. It requires designing, drawing, building, testing and redesigning. Students should demonstrate the ability to use the engineering design process to solve a problem or meet a challenge. Students are made aware that it is okay to fail in their design, in that, that's what the Engineering Design Process is about- they will learn from their mistakes, document, improve, test, redesign.

**Learning Objective:**
Student use the 8 Steps of Engineering Design Process to solve the problem [Float My Boat]:

1. Identify the Need or Problem
2. Research the Need or Problem
3. Develop Possible Solution(s)
4. Select the Best Possible Solution(s)
5. Construct a Prototype
6. Test and Evaluate the Solution(s)
7. Communicate the Solution(s)
8. Redesign

**Essential Vocabulary:**
Engineering Design Process, Prototype, Evaluate, Redesign

**Materials Needed:** Scissors, Tape, Stapler, Ruler, Paper, Straws, Drawing

**Learning Experience(s):**

- Your results should include amount of time, if at all, your boat floated (right side up) and how much weight it could hold and float (suggestions for objects for the boat weight are paper clips, erasers, coins, candy).
- Students will use a sink filled with water to test their designs.
- Possible solution will be presented. Prototype will be created, tested, evaluated and redesigned if necessary, according to the 8 Steps of Engineering Design Process.

**Assessment:**

- Students will create a prototype, test and report results. (Boat)

- Students will use MS Word to list and explain [2-3 sentences per step] the 8 steps of the engineering design process used to implement the prototype.

- Students will use TurboCAD software to design the prototype with measurements, geometric shapes, line widths, line formatting and color, and text labeling.

**Pre Engineering** **Student Name:**

**Building A Structure: Float My Boat**

| CRITERIA | Effective Team Member | Self-directed | Attains Goals | Student Grade |
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| Remarkable 4 | **Always**<br><br>Contributes as **productive and cooperative member** in the design, documenting and implementation of the prototype **to enhance the goal outcome**. | **Always**<br><br>The boat prototype provides **clear evidence of troubleshooting, testing, and refinements based on data or scientific principles.** | **Always**<br><br>The TurboCAD drawing is **neat** with clear measurements and labeling of **all** components. | |
| Acceptable 3 | **Frequently**<br><br>Contributes as **semi-productive and cooperative member** in the design, documenting and implementation of the prototype **to enhance the goal outcome.** | **Frequently**<br><br>The boat prototype provides **clear evidence of troubleshooting, testing and refinements.** | **Frequently**<br><br>The TurboCAD drawing is **neat** with clear measurements and labeling of **most** components. | |
| Making Progress 2 | **Inconsistently**<br><br>**Contributes toward the goal** outcome of designing, documenting and implementation of the prototype. | **Inconsistently**<br><br>The boat prototype provides **some** evidence of troubleshooting, testing and refinements. | **Inconsistently**<br><br>The TurboCAD drawing provides **clear** measurements and labeling of **most** components. | |
| Starting Out 1 | **Rarely**<br><br>**Contributes toward goal accomplishment** of designing, documenting and implementation of the prototype. | **Rarely**<br><br>The boat prototype provides **little** evidence of troubleshooting, testing or refinement. | **Rarely**<br><br>The TurboCAD drawing does **not** show measurements clearly or is otherwise **inadequately** labeled. | |

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| Student's<br>Reflective<br>Assessment |
| Teacher Assessment |