**Lesson 03: Design Your Car**

**Problem statement:** In this lesson the teams will design their car.

**Learning objectives:** Students will understand the basics of the design of a car. They will use these basics to design their own car.

**Lesson standards (NGSS, CCSS, CTE):**

* [Apply scientific ideas or principles to design, construct, and test a design of an object, tool, process or system. (MS-PS3-3)](http://www.nap.edu/openbook.php?record_id=13165&page=67)
* [Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim. (MS-PS3-4)](http://www.nap.edu/openbook.php?record_id=13165&page=59)

**Soft skills:**

Collaboration, creativity, problem solving

**Connections to career and educational pathways:**

This lesson has a connection to the engineering design process because students are doing research and starting the designing

**Materials:**

* Graph paper for designing - 1 per student and 1 more per group
* Calculator
* Raw materials for car design
* Ruler

**Lesson preparation:**

* Make sure there enough computers for all students

**Time required:** 120 mins

**Grouping of students for instruction:** (same as lesson 1)

Students will be placed into groups of 3 and 4 by the instructor. These groups will be mixed skills and mixed grade levels if possible.

Groups will be given the following roles: Secretary (recorder, brainstorming), Materials manager, Project manager (keeping on schedule, keeping on task, etc.), Janitor

Students will be assigning goals to themselves and possibly switching every lesson or every day

**What is the instruction? Consider the PBL Procedure that is being addressed here:**

1. Have students take out their papers from the lesson introduction. Go over the criteria as a class so students are reminded as to what they are doing.
2. “Today you will be designing a car that you will be building as a group. You will have a set list of materials to choose from” Hand out the materials list and have students read the list silently to themselves.
3. Have students research (Google, etc…) how to build cars using household materials. You will want students to have a piece of paper for notes where they can jot down any ideas that they find interesting while they search. They will want to include sources as well.
4. Once students have examined the material list and done some research, each student is to create a labeled diagram of their idea for the car on a piece of graph paper silently. Ensure that each design has a Bill of Materials to ensure that the design is cost-efficient.
5. When each student has completed their labeled diagram, the students will silently pass their paper to the person to the right and they will make a comment or question on the design in front of them. They should also put a score from 1-10 in the upper right hand corner based on how much they like the design. Give 3 minutes for each rotation until all students in the group have seen all designs.
6. Groups will begin discussing what they liked on the designs and what they would like to include on their final design. They will need to make a final design as a group on a new sheet of graph paper and fill out the justification form.
7. Have groups place their designs and justification form on the wall near them and have them rotate around the room to do a gallery walk. This way all students are able to see the different designs of other groups.

**Accommodations:** None identified at present.

**Extensions:** If an individual finishes their design quickly, challenge them to reduce cost by 10%. Or come up with new or improved ideas.

**Assessment:**

Formative assessments

* Individual designs
* Group designs
* Justification form

**References/Resources:**

Material Cost Worksheet