Problem Description

Scott lives in Corvallis. He wants to visit his grandmother in Portland. He can not get to Portland on time without a car. It's key that Scott stays on the highway the whole time to ensure that he gets there on time. Use the provided materials to build a car that can drive straight and roll far enough to get to Portland. The car can be pushed, but can not be touched after release. The car must be able to roll at least 10 ft. The highway is only 3 ft wide and the car must stay within those limits.

Teacher preparation

- Read the activity teacher guide to become familiar with the concept of building the activity
- Build a sample of the activity
- Gather materials needed

Materials needed for this activity

- 1 Storage tote "Toolkit" (refer to appendix for detailed material list)
- 1 pen per student
- One piece of paper for each student

Constraints

- The student is expected to finish the activity within a 45-50 minute time frame.
- Every engineering design step has a designated time limit.
- There are many types of designs possible for assembling the car.The following diagram illustrates five possible designs:

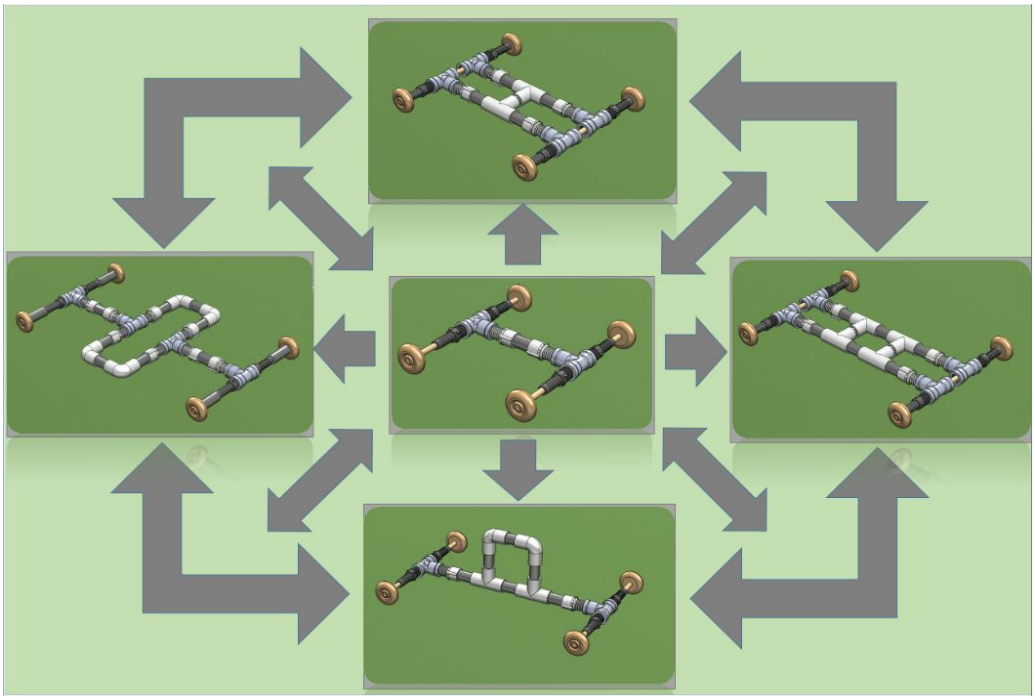

Figure 1: Engineering Design Process Toolkit Car Variations Diagram

Learning outcomes - *The student must...*

- Show an understanding of the problem
- Show an understanding of the solution and the purpose of the solution
- Be able to plan/design the solution
- Be able to implement their plan to the solution with the materials provided at hand
- Be able to test the solution
- Be able to understand why the solution does/not work
- Show an understanding of the engineering design process steps

Introducing the activity

- Distribute materials to students
- Introduce activity
- Proceed to the engineering design process steps

Engineering Design process steps

- **Step 1: Ask** (Duration = 5 minutes)
    - What is the problem that Scott is facing? **(Learning outcome 1)**

- **Step 2: Imagine and plan** (Duration = 10 minutes)
    - Questions to aid the car design:
        - What does Scott need to be able to get to portland? Why does Scott need a car? **(Learning outcome 2)**
        - How can Scott make/build a car? **(Learning outcome 3)**
    - Task:
        - Have the students draw out their designs of the car on paper

- ***Step 3: Create*** (Duration = 20 minutes)
    - Question to aid the car creation
        - Using the materials provided at hand, how will you make the car? ***(Learning outcome 4)***
    - Task:
        - Show the students the possible designs diagram then let them as a group choose the design they prefer to create

- **Step 4: Test** (Duration = 5 minutes)
    - Question to aid testing of the car
        - To check if the car works, we should test it, How can we test if the car works? ***(Learning outcome 5)***
    - Tasks:

        - Have the students test their car designs in the hallway. Measure a 10ft distance and a 3ft width area, if the car rolls up to the 10 ft distance then it is a success.

- **Step 5: Improve** (Duration = 5 minutes)
    - *Questions to aid improving the car*
        - For the cars that did not reach the 10 ft distance, Why did the car not work? How can we re-make the car to improve it? ***(Learning outcome 6)***
    - Debriefing through the following question; re-cap the engineering design steps
        - What have you learned ? ***(Learning outcome 7)***

Adjusting difficulty (Optional)