

Problem Description

Sam is driving to Salem, when he encounters a river that he must pass to get to the other side. A bridge must be built in order for Sam to pass the river safely. It is key that the bridge holds the weight of Sam and his car.

Teacher preparation

- Read the activity teacher guide to be 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)
- Paper
- Cars of different weights

Constraints

- The students are expected to finish activity within a 45-50 minute time frame.
- Every engineering design step has a specified time limit.

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
- 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 the students
- Introduce activity
- Proceed to the Engineering design process steps

Engineering Design process steps

- **Step 1: Ask** (Duration = 5 minutes)
 - Questions
 - What is the problem that Sam is facing? (**Learning outcome 1**)
- **Step 2: Imagine and plan** (Duration = 10 minutes)
 - Questions

- What does Sam need to be able to get to the other side of the river? Why does Sam need a bridge to be built? **(Learning outcome 2)**
 - How can we make/build a bridge? **(Learning outcome 3)**
 - Tasks
 - Have the students draw out their designs of the car on paper

- **Step 3: Create** (*Duration = 20 minutes*)
 - Questions
 - Using the materials provided at hand, how will you make the bridge? **(Learning outcome 4)**
 - Task
 - Show the students the possible designs diagram then let them create the bridge

- **Step 4: Test** (*duration of 5 minutes*)
 - Questions
 - To check if the bridge works, we should test that it will hold a weight of # , How can we test if the bridge works? **(Learning outcome 5)**
 - Tasks
 - Have the students test their bridge designs by adjusting two desks separated by a distance of #ft. Place the bridge on the desks then roll a car of weigh#. If the bridge does not collapse it is a success.

- **Step 5: Improve** (*Duration = 5 minutes*)
 - Debriefing through the following questions
 - For the bridges that collapsed, Why did the bridge collapse? How can we re-make the bridge to improve it? **(Learning outcome 6)**
 - What have you learned ? **(Learning outcome 7)**

Adjusting difficulty (Optional)