How the Engineering Design Process Helped Improve Car Safety
Step 1 (Identify the Problem) What is wrong? ______________

Step 2 (Collect Data/Know the Constraints) How do you know something is wrong? What is holding you back from fixing the problem? Materials? _________________________________

Step 3 (Brainstorm) Work with a team and come up with as many ideas as possible to fix issue _________________________________

Step 4 (Develop & Enact Plan) Pick a plan from the brainstorming ideas and make that plan a reality. _________________________________

Step 5 (Test/Feedback) How did it work? _________________________________

Step 6 (Improve Design) How can we make our plan work even better or do we need to start over? _________________________________
Engineering Design Process
For My VI (Visual Impairment) Student Needs Larger Font Size

Step 1 (Identify the Problem) ________________________________

Step 2 (Collect Data/Know the Constraints)
_________________________________________

Step 3 (Brainstorm)
_________________________________________

Step 4 (Develop & Enact Plan)
_________________________________________

Step 5 (Feedback)
_________________________________________

Step 6 (Improve Design)
_________________________________________
....while I take attendance and update Synergy.
Today's Date: May 14th

Today's Learning Objective:
To understand the Engineering Design Process

Simple Can Change the World

1. Taco Dinner Party
2. Car Safety
3. Worksheet
4. Good
5. Scavenger Hunt

Chapter 18 Review
World Wide Web

The WorldWideWeb (W3) is a wide-area hypermedia information retrieval initiative aiming to give universal access to a large universe of documents.

Everything there is online about W3 is linked directly or indirectly to this document, including an executive summary of the project, Mailing lists, Policy, November's W3 news, Frequently Asked Questions.

What's out there?
Pointers to the world's online information, subjects, W3 servers, etc.

Help
on the browser you are using

Software Products
A list of W3 project components and their current state. (e.g. Line Mode, X11, Viola, NeXTStep, Servers, Tools, Mail Robot, Library)

Technical
Details of protocols, formats, program internals etc

Bibliography
Paper documentation on W3 and references.

People
A list of some people involved in the project.

History
A summary of the history of the project.

How can I help?
If you would like to support the web.

Getting code
Getting the code by anonymous FTP, etc.

The very first website. Created in 1991.
This is how it looked. It is still up and running.
How did the internet go from something so simple to something so complex in less than 30 years?

From this in 1991.....

......to this in 2020.
Let’s watch this Taco Dinner Party video. Link at bottom.

https://www.youtube.com/watch?v=MAhpFt_mWM
1. What was the **main problem** in the video?
2. Where there **any constraints** to solving this problem?
3. What **ideas** did the person in the video come up with to solve the problem?
4. What was their **first solution** to the problem?
5. How did the person in the video know the **first solution had issues**?
6. How important was **testing** in the solution to this problem?
The Scientific Method and the Design Process have many of the same components.

- **Scientific Method**
  - Observation
  - Research
  - Question
  - Experiment
  - Analysis
  - Conclusion

- **Design Process**
  - Look for a Problem
  - Brainstorm Ideas
  - Develop a Solution
  - Build and Test

Both of the processes include finding a problem, the processes need to test out the designs and ideas before figuring out if the solution is effective.
THE DESIGN PROCESS

STEP 1
DEFINE THE PROBLEM

STEP 2
COLLECT INFORMATION

STEP 3
BRAINSTORM & ANALYZE IDEAS

STEP 4
DEVELOP SOLUTIONS/ BUILD A MODEL

STEP 5
PRESENT YOUR IDEAS TO OTHERS FOR FEEDBACK

STEP 6
IMPROVE YOUR DESIGN
Do you remember the flying cars we were looking at a couple of weeks ago? Remember how some did not even require a driver’s license? Let’s say I won the lottery and bought the entire class their own flying cars. Then I gave you the keys and told you to go and have fun flying your new car.

With no training, no rules, no anything……how likely do you think you would end up at a hospital by the end of the day?
From 1900 to 1930 driving was a “free-for-all”. No speed limits, no stop signs, no lanes, simply NO RULES.
Let’s look at how the Engineering Design Process Helped Improve Car Safety.
In the early 1900s automobiles placed speed and power in the hands of individuals who did not have any idea how to use it properly. This caused a soaring rate of traffic deaths and injuries. Those first drivers were like babies figuring out how stuff works.
Intersections were very dangerous in the “Free-For-All” early days of cars on roads.
FIGURE 1. Motor-vehicle–related deaths per million vehicle miles traveled (VMT) and annual VMT, by year — United States, 1925–1997
End the days of “Free-For-All” driving!
1900 - 1930
Engineering Design Process - Round 1

Step 1 (Problem) Lots of injuries and deaths from car usage
Step 2 (Data/Constraints) Accident stats/No Rules/No Controls
Step 5 (Test/Feedback) The “free-for-all” way of driving was ended….roads became much safer and organized.
Step 6 (Improve Design) Statistics show improvement, but driving and riding in cars is still very dangerous - back to the drawing board
FIGURE 1. Motor-vehicle–related deaths per million vehicle miles traveled (VMT) and annual VMT, by year — United States, 1925–1997
Car manufacturers need to make safer cars.

1930 - 1965
At first, the automobile was perceived as a neutral device that merely responded to a driver’s commands and could not cause an accident. But by the early 1930s, manufacturers acknowledged that design flaws compromised safety.
Step 1 (Problem) Car design flaws need to be fixed.
Step 2 (Data/Constraints) Accident reports are showing car design is causing some accidents. Costs of new equipment is expensive.
Step 3 (Brainstorm) Car bodies need better designs. Brakes need to be improved. Cars need to include safety equipment for driver and passengers.
Step 4 (Develop & Enact Plan) Hydraulic brakes and steel body cars installed. Seat belts, energy-absorbing steering columns, and padded dashboards “invented”.
Step 5 (Test/Feedback) Hydraulic brakes reduce the amount of accidents. The steel body is protecting the driver more.
Step 6 (Improve Design) Car still needs more protection for the driver in the case of an accident.
Say Goodbye To Rocky Mountain Brakes

And Say Hello To Hydraulic Brakes
By the 1950s, the stats were greatly improving. There were still lots of issues to be resolved.
Seat belts, energy-absorbing steering columns, and padded dashboards were invented. They were NOT installed because it COST TOO MUCH.
Quietly move around for 2 minutes and re-take your seat.....or quietly think about this question.

We just discussed how car safety improved from 1900 to 1965. During that time frame there were 12 United States Presidents.

How many of those 12 Presidents can you name?
12 Presidents

William McKinley
Theodore Roosevelt
William H. Taft
Woodrow Wilson
Warren G. Harding
Calvin Coolidge
Herbert Hoover
Franklin D. Roosevelt
Harry S. Truman
Dwight D. Eisenhower
John F. Kennedy
Lyndon B. Johnson

All Dealt With Car Safety
Seat belts, energy-absorbing steering columns, and padded dashboards were invented. They were NOT installed because it COST TOO MUCH.

YOU GOTTA BE

KITTEN ME
Ralph blows the whistle!
1965 - 1990
In his 1965 book, Unsafe At Any Speed, Ralph Nadar accused car companies of being resistance to the introduction of safety features. His testimony in front of Congress got many car safety guidelines turned into law.
Step 1 (Problem) Public & lawmakers want safer cars
Step 2 (Data/Constraints) Information shows safer cars saves lives. No laws to enforce safety features in cars.
Step 3 (Brainstorm) All safety devices installed. Tempered glass, air bags, crash test dummies.
Step 4 (Develop/Enact Plan) Laws created that made seat belts, padded dashboards, and other safety features mandatory equipment. Created test labs for cars.
Step 5 (Test/Feedback) Crash test dummy information registered how much force occurred in an accident.
Step 6 (Improve Design) Air bags created solely to protect the driver and passengers.
Switched to Tempered Glass in Windshields
Quick question. How much does a modern crash test dummy cost?
Test crash dummy research led to air bags.
Between 1987 and 2008, it's estimated that frontal airbags saved more than 25,000 lives in the U.S., making them one of the great achievements in automotive safety technology history.
FIGURE 1. Motor-vehicle-related deaths per million vehicle miles traveled (VMT) and annual VMT, by year — United States, 1925–1997
Seat belts: Invented in the 1930s. Made mandatory by law to be installed in cars in the 1960s. Yet by the 1980s & 1990s many people were “too cool” to wear seat belts. 14% usage rate in 1983. So how did they fix that issue?
See any issues with this photo? Look safe? This was a typical car in the 1950s and 1960s.
Any issues here?
Step 1 - I.D. Problem________

Step 2 - Data/Constraints____

Step 3 - Brainstorm______

Step 4 - Develop & Enact Plan______

Step 5 - Test/Feedback________

Step 6 - Improve Design________

A. Seat belt laws go into place in late 1980s and 1990s. “Click it or ticket” is advertised on television and radio.

B. People think seat belts are not really needed. 70% of drivers not wearing seatbelts. I am “too cool” to wear a seatbelt.

C. Make seat belt usage a law. Create a slogan. Give tickets to those not wearing a seatbelt.

D. Police start giving tickets for not wearing seatbelts. Seat belt usage skyrockets.

E. Seat belt usage increases. Still lots of drivers not wearing seatbelts. Police not enforcing the law.

F. People not wearing seat belts.
Today the selt best usage rate is 90%.
FIGURE 1. Motor-vehicle-related deaths per million vehicle miles traveled (VMT) and annual VMT, by year — United States, 1925–1997
Round 5  The Future......Driverless Cars
2020 - ??????????
Car Safety Design Process Timeline

1900 - 1930 Free-For-All
Design Process - Laws/Lights

1930 - 1965 Better Cars Built
Design Process - Brakes/Bodies

1965 - 1990 Driver Safety
Design Process - Air Bags/Testing

1990 - Present - Seat Belts
Design Process - Seat Belts Worn

2020 - ????????? - Driverless Cars
Design Process - A.I./Education
The Engineering Design Process Has Been Improving Car Safety Over The Last 100 Years and It Will Continue To Do So For The Next 100 Years
Before we do our assignment.......and yes it is being graded.
CLASS WORK

Do You Have A Pen And Paper

15:00
Match the Engineering Design Process Steps With The Activity In Making A Successful Paper Airplane For An Upcoming Technology Assignment

1. You take your paper airplane outside and observe how well and how far it flies. Step ____________

2. You pick a design you think will allow you to have a plane that flies the farthest. You make that paper airplane. Step ____________

3. You can only use one sheet of 8 by 11 paper. Paper does not need to be one continuous piece of paper. Airplane will be flown outside. Airplanes will be measured for distance not time in the air. Step ____________

4. You want to design a paper airplane that will fly the furthest of all your classmates. Step ____________

5. After flying your paper airplane outside you modify the wings and the rudder. Step ___________


**Assignment - Provide One Example of How Each Step in the Engineering Design Process Improved Car Safety**

Step 1: Identify the problem_____________________________________

Step 2: Collect data/identify constraints__________________________

Step 3: Brainstorm____________________________________________

Step 4: Develop & Do The Plan___________________________________

Step 5: Get Feedback___________________________________________

Step 6: Improve The Design_____________________________________

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Hard Copy

or

Google Classroom
15 Minutes Later...
Chapter 18 Review

Scavenger Hunt
The Teams

Team 1 - Student #1 Highly Engaged Tier 1 Student & Student #2 Tier 3 Student
Team 2 - Student #3 Highly Engaged Tier 1 Student & Student #4 Tier 3 Student
Team 3 - Student #5 Highly Engaged Tier 1 Student & Student #6 Tier 2 Student
Team 4 - Student #7 & Student #8
Team 5 - Student #9 & Student #10
Team 6 - Student #11 & Student #12
Team 7 - Student #13 & Student #14
Team 8 - Student #15 & Student #16
Team 9 - Student #17 & Student #18
Team 10- Student #19 & Student #20

*I have had success in the past with matching Tier 1 students with Tier 2 and 3 students.

* 20 is the maximum amount of students I can have in my Technology class.

*Tier classification is never brought up in class.
5 Cs Scavenger Hunt Using The Engineering Design Process

Step 1: **Identify The Problem** - In the room there are 5 sheets of paper that list the 5 Cs of Learning hidden in the room. They are taped to an item in the classroom. You need to find them before your classmates find them.

Step 2: **Data/Constraints** - You will work in **teams of 2**. The 5 Cs are located in the main part of the classroom. Not upstairs and not in the side rooms. You don’t have to climb anything or move anything to see the 5 Cs. You might have to bend down. During the scavenger hunt you may only communicate non-verbally. Running is not allowed. Time constraint - **class is almost over**.

Step 3: **Brainstorm** - You will have 5 minutes to figure out a plan to search for the 5 Cs, how to communicate non-verbally and how to alert only your teammate when you discover one of the 5 Cs.

Step 4 - **Develop the Plan/Do Plan** - After the 5 minutes you will search the room and communicate using the strategies you just brainstormed.

Step 5 - **Get Feedback** - The first three teams to find and write down the the 5 Cs and turn in written locations will get to pick two items from our class snack jar.

Step 6 - **Improve the Design** - Regardless if you finished in the Top 3 or not, think about the strategies that worked and those that did not. Be prepared to implement a new strategy if we do another scavenger hunt.
Five Minutes To Brainstorm and Develop A Plan. Remember the constraints.
5 Cs Scavenger Hunt Using The Engineering Design Process

Step 1: Identify The Problem - In the room there are 5 sheets of paper that list the 5 Cs of Learning hidden in the room. They are taped to an item in the classroom. You need to find them before your classmates find them.

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Step 6 - Improve the Design - Regardless if you finished in the Top 3 or not, think about the strategies that worked and those that did not. Be prepared to implement a new strategy if we do another scavenger hunt.
5 MINUTES LATER...
123 GO!

NO TALKING
Communication

Collaboration
And remember........no matter how big or small a problem you have......you can use the Engineering Design Process to help solve that problem.

ENJOY THE REST OF YOUR DAY!!!
That's all Folks!