

Week 11

***Introduction to
the Design
Process***

ENGINEERING DESIGN PROCESS

The formal, iterative process used to design and build solutions, often explained in 5-8 steps.

Also called EDP.



EDP VOCABULARY TERMS

Formal —

The steps of the design process are followed in a particular order (clockwise)



EDP VOCABULARY TERMS

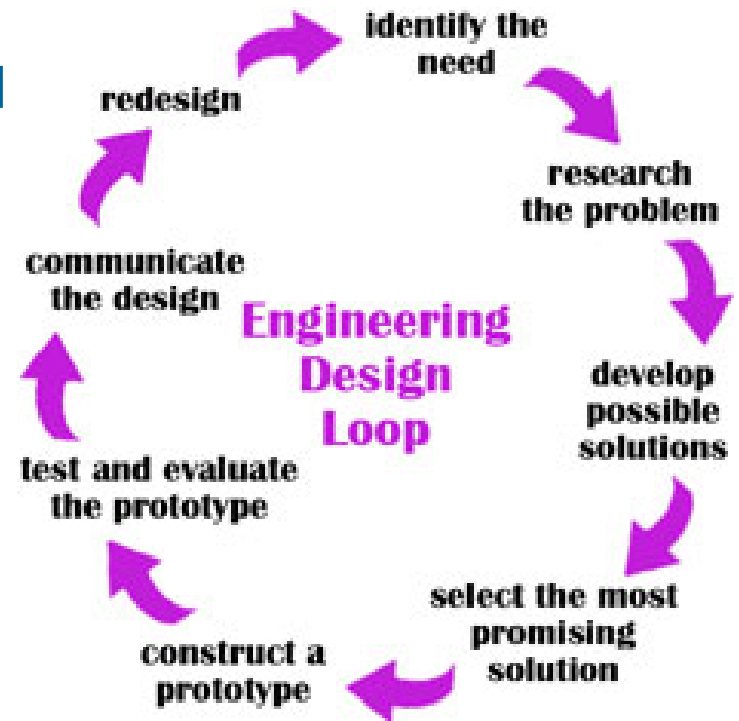
Iterative —

- Repetitive
- The Steps of the EDP may be conducted many times, resulting in the generation of many designs and prototypes.



ENGINEERING DESIGN PROCESS

1. Define the problem/Identify the need
2. Research the problem
3. Brainstorm/develop solutions
4. Select the solution
5. Build/construct prototype
6. Test and evaluate prototype
7. Communicate the design
8. Redesign (as needed)



EDP VOCABULARY TERMS

Criteria —

A limitation or restriction



EDP VOCABULARY TERMS

Constraint —

- Standards against which something must be judged
- Minimum expectations assigned for a design



EDP VOCABULARY TERMS

User —

A person using the solution

Client —

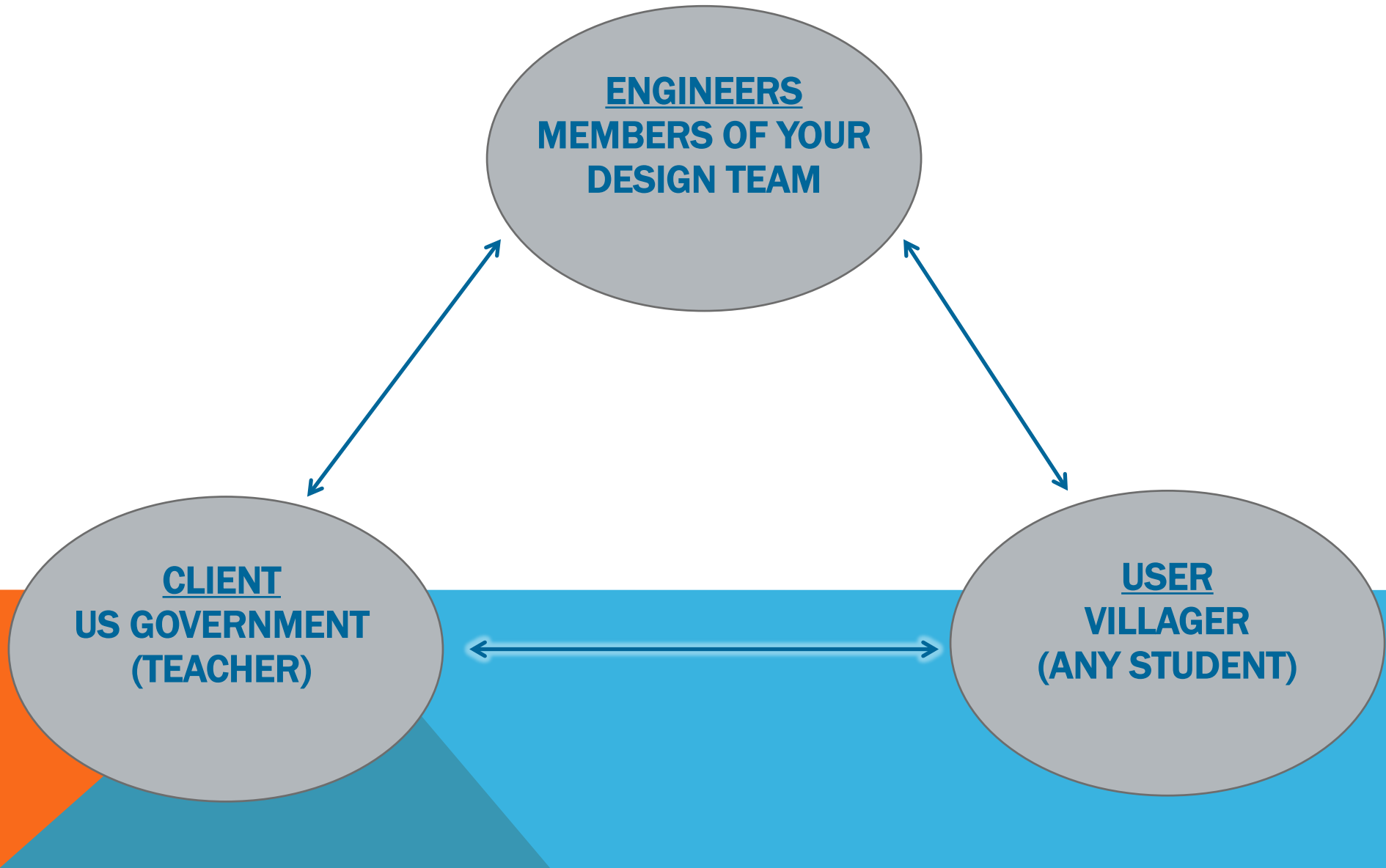
A person who hires the engineer

Engineer —

A person who designs solutions



STAKEHOLDERS



ENGINEERING DESIGN PROCESS

1. Define the Problem/Identify the Need

- Make clear the need for a solution.
- Identify the criteria and any constraints.



HW PROBLEM THIS WEEK:

CLIENT STATEMENT



The US government hires you to design and build a device to protect eggs falling from the sky. The government wants to drop eggs from an airplane in a secluded village to help with the shortage of food. The government want to keep the cost to a minimum.

- Low cost device that can protect an egg under free fall.

CLIENT'S CRITERIA

- Can only use: cardboard, glue, ballons.
- Must protect at least 2 eggs.
- Each dimension has to be smaller than 20 cm.
- Can be manipulated with hands.
- Costs equal to, or less than, \$1.
- Is completed in less than 2 hours.



ENGINEERING DESIGN PROCESS

2. Research the Problem and define problem constraints

- Collect information about concepts relevant to the problem statement.
- Take notes (in own words) from valid sources.

REVERSE ENGINEERING

The process of conducting research on how a solution (object or process) works, in order to understand what works well and what does not work well.




Research relevant topics:

- the structure of the human hand
- the function of the human hand

And then:

Conduct *reverse engineering*:

- assistive hand devices that have already been invented
 - assistive technologies for gripping cups
 - the pros and cons of both (above) technologies
- 
- The bottom of the slide features a decorative graphic consisting of three overlapping geometric shapes: a large orange triangle on the left, a medium teal triangle in the center, and a large light blue triangle on the right. These shapes are arranged in a way that they appear to be part of a larger, abstract design.

REMEMBER...

In your research,
consider the *materials*
you will use and their
costs per unit



ON NOTEBOOK PAPER

Pros

Cons



BUDGET

- A determined quantity that must be considered in design and testing plans
- A constraint




ENGINEERING DESIGN PROCESS

3. Brainstorm Solutions

Generate ideas that will solve the problem (as defined in step 1, *Define the Problem/ Identify the Need*).



BRAINSTORMING RULES

1. Generate as many ideas as possible.
 2. Withhold judgment and be respectful.
 3. Encourage wild ideas.
 4. Build on others' ideas as much as possible.
- 
- Decorative geometric shapes at the bottom of the slide, including a large blue triangle and a smaller orange triangle.

ENGINEERING DESIGN PROCESS

4. Select the Best Solution

Pick one design that will best **solve the problem.**

*All members of the design team **must agree** to start with this choice.*



ENGINEERING DESIGN PROCESS

5. Build Prototype

Followed by



6. Test and Evaluate Prototype

Observe and collect data on how your design performs, whether criteria are satisfied.



7. Communicate the Design

ENGINEERING DESIGN PROCESS

8. Redesign

Go back to any step in the EDP and revise your prototype, according to feedback from step 7, *Communicate the Design*.
Make a final presentation.

