

Introduction to Design: The Process

Session 3



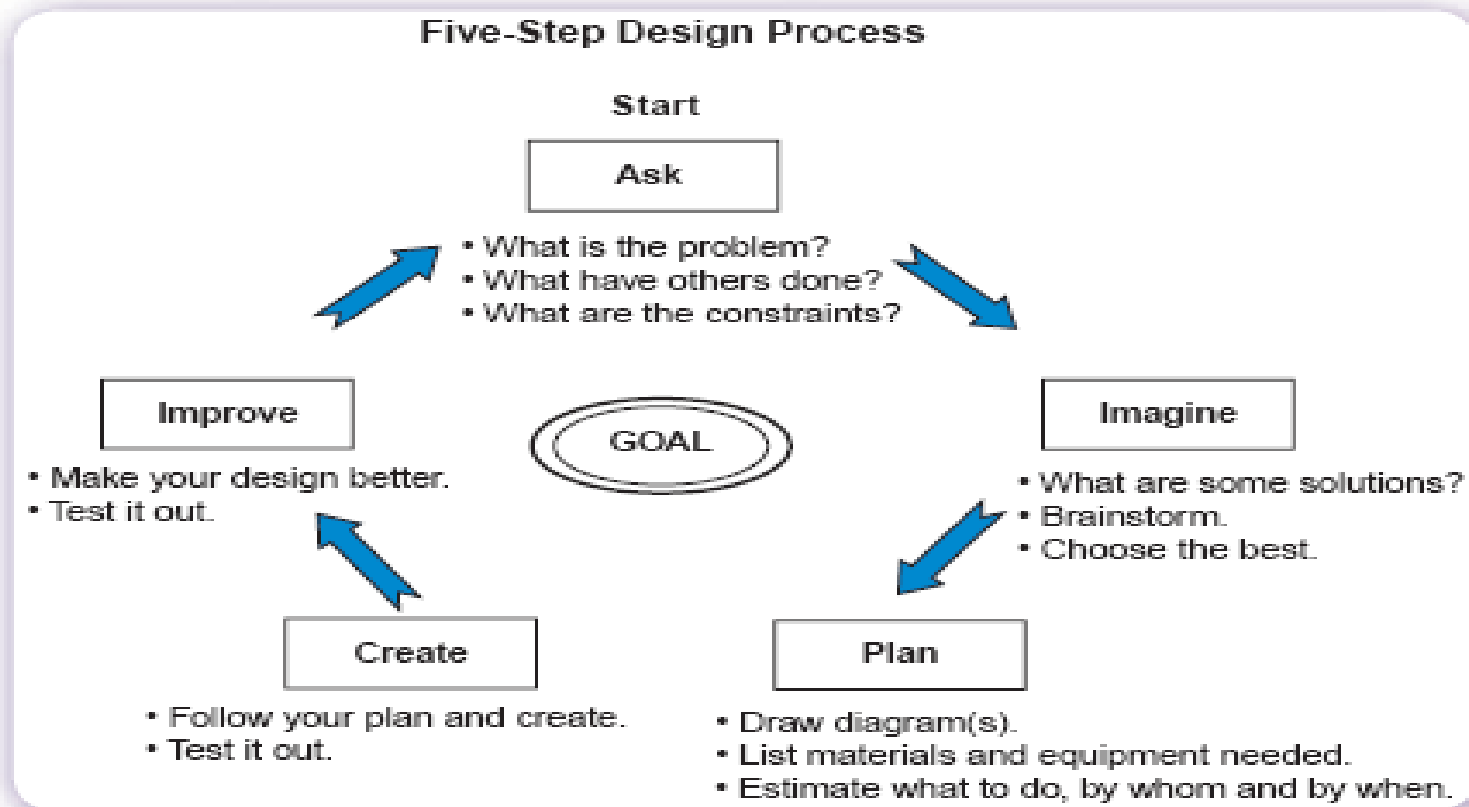
Design Definition

Engineering design is the process of devising a system, component, or process to meet desired needs. It is a decision-making process (often iterative), in which the basic sciences, mathematics, and the engineering sciences are applied to convert resources optimally to meet these stated needs.

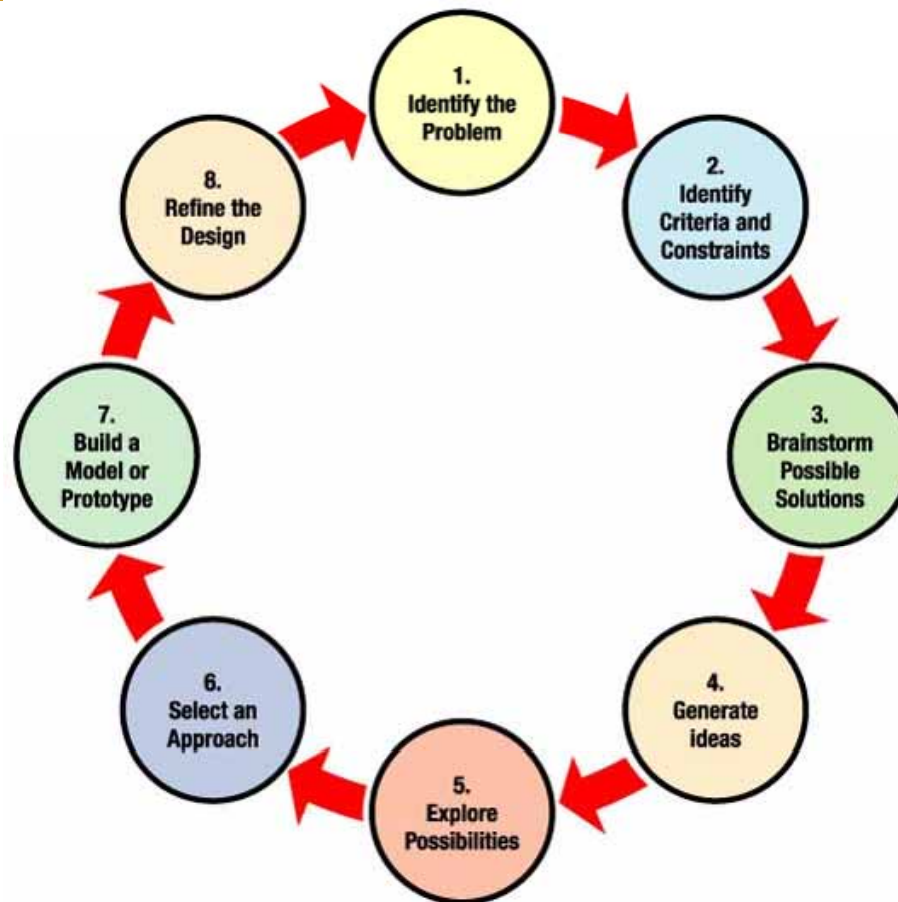
...students must attain:

- **an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.**

Iterative Schematic 1



Iterative Schematic 2

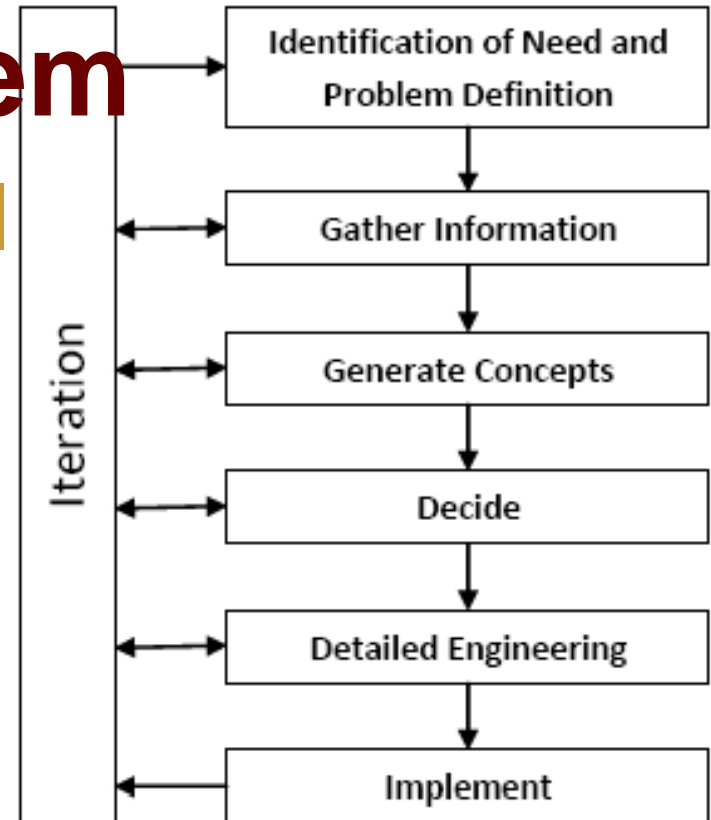


http://www.nasa.gov/audience/foreducators/plantgrowth/reference/Eng_Design_5-12.html

Session 3

ID of Need/Problem

- Based on client
- Seek to understand
- Understand “real” need
 - Perceived vs. reality
- Evaluate assumptions
- No bias or assumed solutions
- Problem definition



Gather Information

- **Diverse requirements and information**
- **Don't re-invent the wheel**
 - Published; patent; internet; standards or codes;
- **Environmental, social, ethical...**
- **Similar problems?**
- **Who has expertise?**



General Concepts

- **Creative stage**
- **Team work**
- **Preliminary and conceptual**
 - Anything goes
- **Generate, not evaluate**
- **Deliverable: Portfolio**

Decide

- **Narrow designs**
 - Objective criteria
 - Criteria weights
 - Engineering analysis
 - i.e., weight, cost, efficiency, recyclable
- **Justify decision**

Detailed Engineering

- Full engineering analysis
- Requires detail and documentation
 - Reproduce or check calculations
 - Component selection
 - Drawings
 - Testing



Implement

- **Large systems**
 - Proof-of-concept model
 - Tests most critical aspects
- **Smaller systems**
 - Prototype
 - Fully functional product or system

Iteration

- **Re-visit previous stages**
 - New information
 - Unexpected results
 - New ideas
 - Changing market
 - Team dynamics
- **Multiple times?**