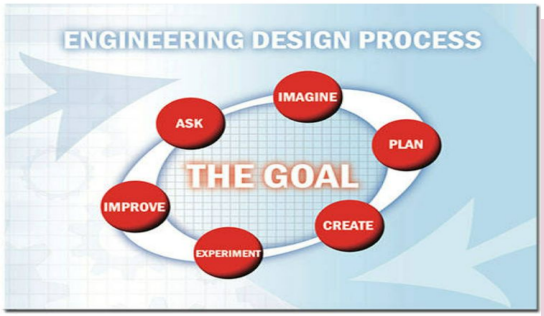


3 Engineering Design Processes

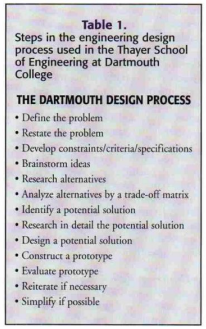
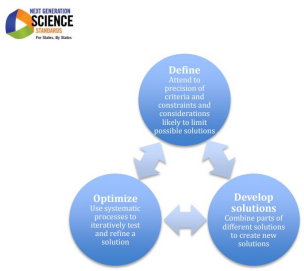


Table 1.
Steps in the engineering design process used in the Thayer School of Engineering at Dartmouth College

THE DARTMOUTH DESIGN PROCESS

- Define the problem
- Restate the problem
- Develop constraints/criteria/specifications
- Brainstorm ideas
- Research alternatives
- Analyze alternatives by a trade-off matrix
- Identify a potential solution
- Research in detail the potential solution
- Design a potential solution
- Construct a prototype
- Evaluate prototype
- Reiterate if necessary
- Simplify if possible



Dartmouth Design Process Table 1 (Elsa Garmire)	Engineering Design in the NGSS (April 2013)	NASA Engineering Design Process
Define the problem	Define	Ask
Restate the problem	Attend to precision of criteria and	Imagine
Develop constraints/criteria/specifications	and constraints and considerations	Plan
Brainstorm ideas	likely to limit possible solutions	Create
Research alternatives		Test /Experiment
Analyze alternatives by a trade-off matrix	Develop Solutions	Improve
Identify a potential solution	Combine parts of different solutions	
Research in detail the potential solution	to create new solutions	
Design a potential solution		
Construct a prototype	Optimize	**Similar background colors in each column
Evaluate prototype	Use systematic processes to iteratively	correlate to similarities in the engineering
Reiterate if necessary	test and refine a solution	design process**
Simplify if possible		

Dartmouth
Industry driven for workplace
Numerous steps
Large amount of research
Prototype is analyzed extensively
Trade-off matrix is unique to this design

+

NGSS
Builds off of prior design practice for earlier grades

It's a framework that demonstrates an understanding of science through this engineering practice

+

NASA
A problem solving guide for students

Steps help create a successful NASA mission

=

All three engineering design processes incorporate:

A cyclic process
Teamwork
Compromise
Communication