

# Comparative Analysis of Design Models

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### Key: Comparison to Scientific Method

- State the Question
- Collect Information
- Form Hypothesis
- Test the Hypothesis
- Study Data
- Draw Conclusions
- Report Results



### Dartmouth Design Process (Gamire, 2003)

- Define the Problem
- Restate the Problem
- Develop constraints/specifications
- Brainstorm ideas
- Research Alternatives
- Analyze Alternatives
- Identify Potential Solution
- Research in Detail Possible Solution
- Design a Potential Solution
- Construct Prototype
- Evaluate Prototype
- Iterate if Necessary
- Simplify if Possible

**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
  - Iterate if necessary
  - Simplify if possible

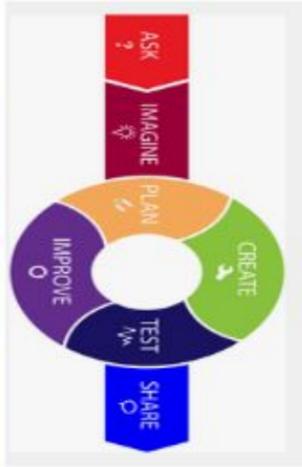
### Science & Engineering Practices NGSS

- Asking Questions/ Defining Problems
- Developing & Using Models
- Planning & Conducting Investigations
- Analyzing & Interpreting Data
- Mathematical & Computational Thinking
- Constructing Explanations/ Designing Solutions
- Engaging in Argument From Evidence
- Obtaining, Evaluating, & Communicating Information



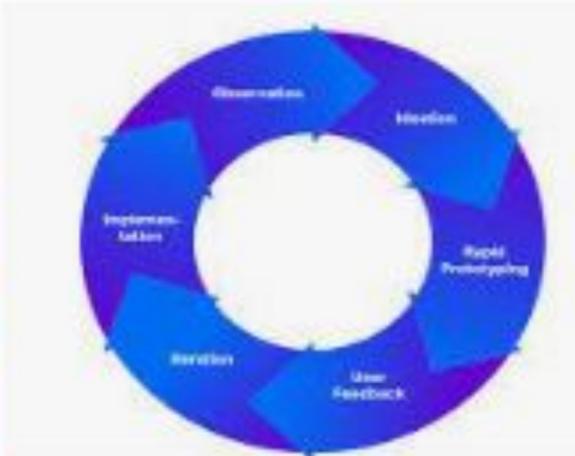
### NASA Engineering Design Process

- Ask
- Imagine
- Plan
- Create
- Test
- Improve
- Share



### IDEO Consumer Experience Design Process (Business Week-Nussbaum 5/2004)

- Observation
- Brainstorming
- Rapid prototyping
- Refining
- Implementation



**Gamire (2003): "All Design is a Compromise. Engineering Design involves teamwork."** This comparison of design models is using the steps to the Scientific Method as a key. I know more modern science and engineering models are trying to get away from the more limited, rigid Scientific Method, but I kept coming back to these steps when examining the models. When examining the different designs I saw many similarities and variations to the Scientific Method. The Similarities are shown with the different colors. All four design models have steps similar to Question, Research, Hypothesis, Test, Analyze, Conclusions, Report. Differences: The order of the steps differs, especially with research. The models more often show the research step coming after observation and testing. NGSS is a framework that demonstrates understanding of science through engineering practice. NASA is an iterative process for students that engineers use to guide them in problem solving. The Dartmouth Design Process is an industry driven process for the workplace with many steps and research to get the best product. The IDEO is a consumer experience design process where observing the consumers is a major component to create a prototype that enhances and improves their experience. All of the processes are cyclical with models, compromise, teamwork to create the best product, plan and solve the problem