# Comparative Analysis of Design Models

**ITEEA**
- Define the problem
- Brainstorm
- Research and Explore
- Identify constraints
- Consider alternatives
- Select an approach
- Develop written proposal
- Make model
- Test and evaluate
- Refine and improve
- Create Product
- Communicate Results

**DARTMOUTH ENGINEERING**
- Define the problem
- Restate the problem
- Determine constraints
- Brainstorm
- Research alternatives
- Analyze tradeoffs
- Identify solutions
- Research models
- Design prototype
- Test
- Evaluate
- Simplify

**NASA**
- Ask
- Imagine
- Plan
- Create
- Experiment
- Improve

## Similarities
- all are considered cyclic, not linear
- all involve defining a problem, brainstorming, modeling, prototypes, testing and retesting
- all involve improving and refining the product

## Differences
- NASA appears more streamlined
- the order of the steps in each process may vary
- Dartmouth analyzes the tradeoffs and spends more time refining the context before beginning the design process

## Synthesis

In general, a design process can be defined as a sequence or cycle of activities used to design something that solves a problem, serves a purpose or satisfies human needs. (sciencedirect.com)

The three design processes presented above meet all of the criteria specified in the definition, but some appear a bit more detailed and even convoluted in some cases. For instance, Dartmouth's restating the problem seems redundant, but the rationale is to make sure the engineers are to truly clarify and parse the problem being solved. Dartmouth's focus is to be context oriented, and so there are several checkpoints for context appropriateness.

Presented below is a series of steps that takes into account the three design methods and presents a more direct path. The details that are included in ITEEA and Dartmouth processes will undoubtedly be encountered along the way, but in the context of teaching students in a K-12 setting, this shorter series of steps allows younger, aspiring engineers to have a direction without being overwhelmed by minutiae.

Problem → Brainstorm → Choose options → Construct and test → Evaluate and revise as needed → Present

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