

 <p>NASA Engineering Design Process https://www.nasa.gov/audience/foreducators/best/edp.html</p>	 <p>APPENDIX I – Engineering Design in the NGSS</p>	 <p>Garmire, E. (2003). The Engineering Design Process. <i>The Technology Teacher</i>.. 22-28.</p>
<p>Ask</p> <ul style="list-style-type: none"> ● Clarify what the problem is. ● Identify conditions & limitations. ● What do we have to work with? ● What is the challenge? ● Once students understand the problem they can begin to imagine a solution. 	<p>Define</p> <p>“Defining and delimiting engineering problems involves stating the problem to be solved as clearly as possible in terms of criteria for success, and constraints or limits.”</p> <p>APPENDIX I – Engineering Design in the NGSS</p>	<ul style="list-style-type: none"> ● 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 ● Construct a prototype ● Evaluate prototype ● Reiterate in necessary ● Simplify if possible <p>Garmire, E. (2003). The Engineering Design Process. <i>The Technology Teacher</i>.. 25.</p>
<p>Imagine</p> <ul style="list-style-type: none"> ● Brainstorming ● Out-of-the-box ideas ● Ideas evolve ● No BAD ideas ● Creative juices flow ● Simple/complex/”Insane” solutions ● Collaboration & support each other's ideas 	<p>Develop Solutions</p> <p>“Designing solutions to engineering problems begins with generating a number of different possible solutions, then evaluating potential solutions to see which ones best meet the criteria and constraints of the problem.”</p> <p>APPENDIX I – Engineering Design in the NGSS</p>	

		
Plan <ul style="list-style-type: none"> ● Pick one idea ● Slow down ● Sketching to visualize (simple) ● Decide best way to build ● Choose 1 variable to change 		
Create Build it! <ul style="list-style-type: none"> ● Emphasize teamwork ● Follow initial plan-use sketches ● Build model to experiment with later 		
Experiment Test it! <ul style="list-style-type: none"> ● Controlling single variable ● Measure and record data ● Changes make a difference ● How can I improve this? 	Optimize “Optimizing the design solution involves a process in which solutions are systematically tested and refined and the final design is improved by trading off less important features for those that are more important.” <small>APPENDIX I – Engineering Design in the NGSS</small> 	
Improve Final Phase <ul style="list-style-type: none"> ● The entire process is repeated 		

Tammy Martinez

Similarities

Each of the above Engineering Design Processes are founded on the premise of identifying a problem and finding a solution for it. Each process includes the steps of asking questions, identifying limitations and working as a team to brainstorm ideas for possible solutions. Each process also requires that one “best” solution be chosen to build and test. Through testing, each process requires the collection of data to lead to the improvement of the model.

Differences

The NASA and Dartmouth Engineering Design Processes have clear steps of their process. The NGSS Design Process is made up of the three stages that increase in complexity as it applies to higher grades. Within each stage of the NGSS Design Process, there are multiple steps that can be identified in the other Engineering Design processes as a single stage. The Dartmouth Design Process also incorporates a Tradeoff Matrix for data collection.

I, personally, find the NASA and NGSS Engineering Design Processes to be more teacher and student-friendly for elementary. The NGSS has its own process for each grade. The Dartmouth Design Process is more specific within each step of the process.