

## N.A.S.A.'s B.E.S.T.: The Engineering Design Process

The Engineering Design Process is intended to help you identify a problem, imagine possible solutions to a problem, envision products that solve that problem, create and test a product, and make modifications and improvements to that product. Videos detailing each of these stages may be found here:

<http://www.nasa.gov/audience/foreducators/best/edp.html>

1. Ask—This stage is meant to clarify exactly what the problem is as well as conditions and limitations that govern a practical solution to that problem.
2. Imagine—This stage can be thought of as the ‘brainstorming stage’. Try to envision a wide array of possible solutions (i.e. not just sensible ideas but out-of-box ideas too). There are no bad ideas! Please make sure you are working well with your team, that you support your classmates’ ideas and participate.
3. Plan—Now that we have imagined tons of potential products that solve our problem we can start working towards creating one product. However, since we have limited time, your team need to pick one idea that seems most promising. Before your team just dives in and start building you need to do some planning (e.g. drawing schematics). You might wonder--why do we need to plan? Since there is a limited amount of time and money we might benefit from slowing down and sketching. Sketching helps engineers visualize what they are going to do prior to building. Similarly, sketching will help us visualize what we are about to do. Your sketches need not be works of art. The measure of whether your sketches are well done is whether you can build something from it. Consider drawing three different perspectives for your sketches.
4. Create—Now we get to build! Please emphasize teamwork, work within the limitations set, follow the initial plan (you can make changes later), use your sketches, and prepare to experiment with your one product.
5. Experiment—Now that the model is done it is time to test it! Remember that good scientific experiments involve changing (i.e. manipulating) just one variable at a time. Record your results through this stage so you can tell later whether a single change made a difference. Recording your data will also help you brainstorm ideas as for how you can improve your design.
6. Improve—After experimenting with your model you will probably see ways to improve it. This final phase of the engineering design process is very important because **it is here that the whole process is repeated**; Ask: what didn’t work? What might work better? Imagine—what are some possible new solutions? Plan—make new sketches Create—make changes to the original model or reconstruct it entirely. Experiment—measure and test—are my changes making a difference? You will most likely have to repeat this process

several times before arriving at your finished product. **Overall, the most important thing we want to take away is that the engineering design process is cyclical—not linear.** Once you understand this, you can apply it to any problem.