The Engineering Process: Crash Course Kids #12.2

I'm gonna take a wild guess and say you've probably used a _____. And I bet you've enjoyed the _____ of a little thing we call ___ _____. Do you know who made those things possible? Engineers. We were just talking about engineers in our last video: People who design and build things to solve problems, and there are lots of different kinds of engineers. No matter what type of engineer you wanna be, whether civil, _____, electrical or a kind that doesn't even _____ yet, there's a _____ of _____ that all engineers _____ when they're trying to solve a problem. This process is called the _____ process. Makes sense to me. So what sort of steps are included in the engineering process, and why do we need them? Let's go through it step by step and discover _____ awesome things _____ _____.

The first thing you gotta do is just _____ the problem. I mean before you can solve a problem you have to _____ _____ what it is, right? For example, back in the 1800s, an engineer named Alexander Graham Bell was trying to _____ ___ _____ a simpler, cheaper way for people to _____. Back then the best you could do was a _____, which is an old-fashioned system of sending messages over electrical _____. Bell _____ his problem: communicating with people who were far away was expensive, and _____ a lot of time. So his _____, or solution to this problem, was something you may have heard of: the _____.

Now, once you've figured out what problem you want to _____, you need **to do your** _____. You can start by just making a list of questions you have and what information you need to start answering them. You can also look around and find what other things already _____ that have tried to solve this _____ problem. Maybe they can be _____. A good example here is the man who helped us _____ stuff ___. The chemist and engineer Alfred Nobel invented the _____ known as _____. Not because he particularly enjoyed _____, but because _____ and other people who, well, needed to blow stuff up to do their jobs, needed an _____ that was _____ to use. So, before he started on that problem, Nobel did research to see what explosives already _____, which ones _____ _____, and which ones _____.

This takes us to step 3: _____ **a solution**. After your _____ is done, this is where you say exactly how you think you can _____ the problem, and once you've thought of a good _____, you have to figure out how it'll actually work and what it will look like, so you have to _____ **your solution**. This is where you get to _____! Civil engineers always _____ _____their ideas like buildings and bridges and towers to show what they'll look like when they're done. Gustave Eiffel designed the famous Eiffel Tower in France, and he definitely showed up on day one of _____knowing exactly what it was gonna look like.

On to step five: _____ **a** _____. A prototype is just a simple _____ that lets you _____ _____ your _____. It can be as _____ as the real thing's going to be or it can be a _____ _____. You just need to have a prototype so you can test it! This may be the most important _____ in the whole _____. Engineers need to test their design to see if it works like how they want it to. So, say, if your building's a big _____ does it stand up? Does it _____ standing up? If you're designing something with _____ parts, does it work the way you want?

Now, take it from me, my future engineers, you might have a great idea, a really _____ solution to a really big problem, but when you get to this step your prototype probably won't work _____ the way you want. At least, not on the first _____. Most engineers test their prototypes over and over and over again. That's why a lot of time and _____ goes into the very last step: _____ **your solutions**.

"Evaluating" just means asking yourself whether things are working the way you want, or why they are or aren't. I like to think of this step as "_____ everything". This is when engineers _____ all of the facts and ask themselves questions followed by even more questions. What worked well? Why did it work? Why didn't it work? How could it be made better?

Most of the time the answers to these questions are going to _____ you back _____ steps. Like, once you've figured out why your _____ wasn't working, you'll have to _____ a new solution and then _____ it and then _____ it again. Sometimes engineers ___ _____ this process four, five, or even six times or more. Take Willis Carrier, the _____ of modern air conditioning. He tested his _____ for years before he figured out the design that worked the way he wanted and solved the problem he wanted to fix. Like all engineers, he _____ a lot before he _____, and that's okay because he learned something from every _____, which made his _____ even better in the end, and I, for one, am glad he _____ going.

The engineering process is a _____ of steps that engineers, or anyone, should use when they're facing a _____. The process is important because it _____ engineers to _____ and also to fail. Both of these things give engineers a chance to go back and _____ on their _____ idea, giving us something even better _____ _____ _____. The next time you fail at something, don't feel too bad. Think about the telephone and the air conditioner and the Eiffel Tower, and then try again.