

Design Tool 4.2: Dear Student

Dear Student,

What do you know about the world around you? What challenges and problems do we face? What jobs will be out there when you graduate? What skills will you need?

We don't know all the answers to all of those questions, but one thing we do know: We need more people who know how to tackle the tough problems facing us such as clean water, health and medicine, the environment, extreme poverty, and technology.

To prepare you for this world, we are going to teach some STEM lessons in our classes. STEM stands for Science, Technology, Engineering, and Math. Here is what that's going to look like.

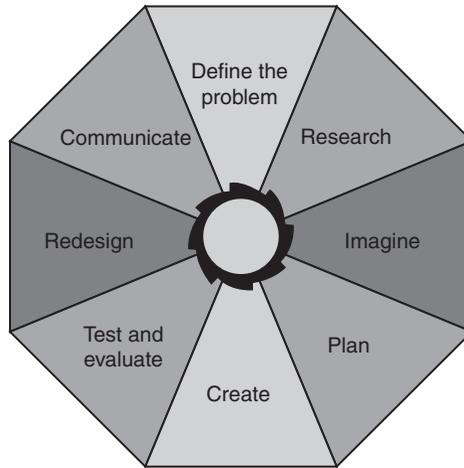
STEM

You will be working in teams to solve a real-world problem

Take a look around for some problems that need to be solved. You may have noticed runoff from your school campus carrying soil into the local streams. You may have seen trash that could be recycled and used to construct something useful. Maybe the school band needs some sort of musical device to make a special kind of sound for a program.

Or maybe you could design a safer infant seat; a faster roller coaster, a locker caddy, disposable lunchroom trays, or a solar-powered device. You might even design a container to keep lunches hot or cold. These are all STEM challenges that have been taken on by students like you.

When you work on STEM problems, you'll practice a way to think clearly about problem-solving. This way of thinking is called the **Engineering Design Process**. You don't have to follow the steps in any particular order but in our STEM lessons most steps will be there in some order.



Engineering Design Process

Pretend you live in an earthquake zone. You are going to design a house that will withstand an earthquake. Once you know the problem, your team will do some **research** to get information about it. That doesn't mean you'll have your heads buried in books. You might interview some experts or conduct experiments to get information. You might find students in other schools who have worked on this same problem and talk to them online.

Based on what you learn, you and your teammates will brainstorm and **imagine** many ideas for how to solve this challenge. Together you will choose the idea you think would work best and **plan** how you will create your earthquake-proof house. The neat thing is that you don't have to worry about coming up with "the" right answer. Several solutions may work. Your team might come up with an entirely different solution than any other team. That would be great!

You'll **create** a model or "prototype" of your house. After constructing this prototype you will **test** it on an earthquake table and **evaluate** the results to see if it works.

What if it doesn't work? What if your prototype fails? Engineers will tell you that their prototypes often fail. Their first try seldom works as well as they'd like. So, no worries. Failure is an important part of learning for all of us, and you'll use what you learn on the first try to help you **redesign** and improve your solution.

Communication is also an important part of STEM, so you and your teammates will figure out how to best communicate information about your design and your results. You could use technical writing, drama, art, a poster display, a video, or some other type of communication.

What will STEM lessons require of you?

- ◆ *Be a good team player.* Have you ever worked in a team that didn't get much done because someone dominated, and someone else didn't participate at all? That mustn't happen on a STEM team. You'll be operating like a group of engineers, and you should work in a smooth, cooperative way. You want your team to be successful.
- ◆ *Be as creative as you like.* Remember, there's more than one right answer. Don't be afraid to suggest some far-out ideas and be innovative.
- ◆ *Use both science and math to design solutions.* If you don't understand the science or math involved, just say so. A teammate might be able to explain, and your teacher will be available to help as well. Using math and science to find solutions (like engineers do) will help you understand those subjects better.
- ◆ *Use and create technology.* You will probably use several types of technology: computers and other digital devices, and science equipment, for example. Actually, when you create any device to solve a problem, you are creating a technology. That's what technology is—anything made by people to meet a need or a want. Safer skateboards, solar ovens, game controllers, protective sports gear, a better blood flow monitor, you name it.

Have a lot of fun with these STEM projects, but take them seriously. They will teach you how to approach problems and then research and design solutions for problems that face your world. STEM will help you make sense of science and math because you will use these in solving problems and meeting challenges. Even if you don't go into a STEM field, you'll still be better prepared for life because of what you will learn through STEM classwork.

Have fun learning!

