

Does anyone know what engineering is? Let's come up with a class definition of what engineering is and what engineers do. Engineering is defined as *inventing and building things for the benefit of society*. So, engineers work in many different fields to create new products and improve existing products to make better the lives of people. As they are creating such products, engineers use the engineering design process to develop their ideas and inventions.

The engineering design process involves six basic steps. The idea behind the process is such that once the first design is built, the product can be further improved by restarting the process. The steps in the design process are listed below. (Write steps on the board)

Design Process Steps

1. Find the need.
2. Define the problem.
3. Brainstorm to come up with ideas.
4. Select the most promising design.
5. Plan and manage the project.
6. Build-test-refine the design.

Brainstorming is a very important part of the design process. Teams of engineers work cooperatively and come up with many ideas to find the best solution to the challenge at hand. Some guidelines for brainstorming are: (Write guidelines on the board.)

- Provide only positive comments (no negative comments are allowed at this stage of the design process).
- Encourage wild ideas.
- Write all ideas down
- Stay focused on topic.
- Hold only one conversation at a time.
- Build on the ideas of others.

Commonly in engineering, the best solution is not the most obvious, so engineers must think "outside the box." Can someone explain to the class what "thinking outside the box" means? That's right! It means thinking of a creative and perhaps unusual approach to the problem, by looking at the problem from a new angle — or tackling the problem in a new way. Engineers spend a lot of time refining and improving already existing products, so they must be open to new ideas.

In addition to learning HOW to solve problems, engineers need to learn WHERE to search for answers. One way is to examine products and projects from the past, so as to learn from failures and build on successes.

Let's take some time to think about all the things in your daily life that must have been designed by engineers. Buildings are designed by civil or architectural engineers, along with mechanical, construction management and electrical engineers (at a minimum). What other kinds of engineers do you know about? Grab a partner and make a list of 10 things that you come across every day that were designed by

engineers. Now that you have your list...what types of engineers would be involved in designing each one? Or, what would a person have to know a lot about to design each item on your list?

Along those lines, what kind of engineers would be involved in designing the Seahawks stadium? Different aspects of stadiums that require the expertise of different types of engineers. Structural engineers make sure the overall framework is strong and meets the needs of athletes and fans. Electrical and computer engineers design the lighting and scoreboard, while civil engineers design the road systems and parking lots. Acoustical engineers are in charge of the enormous sound system. Mechanical engineers ensure the stadium has running water and air conditioning or heating, while sanitary engineers design to meet plumbing needs.

Look back over your list of items and see if you can add more about what types of engineers designed them. Many different types of engineers contribute to a wide range of products and projects. Chemical engineers for example, work closely with the medical industry to create new medicines to treat diseases, such as cancer. An environmental engineer might analyze how birds are impacted by pollution or how to clean a community's water source.

The many different types of engineers all vary in their specialties. Some examples: mechanical, electrical, civil, environmental, biomedical, aerospace, computer science, agricultural, transportation and chemical engineers. Here are some pictures and photographs of products that were designed and built by engineers. (Show pictures/photographs of engineered products that might interest students. Provide a creative range of products, for example, water systems, aspirin, roller coasters, stereos, shampoo, appliances, etc. Even cell phones and iPods may surprise students.) You may be amazed to learn that just about everything had an engineer involved at some point. How do you think these things were created? Do you think one person designed each one? Most likely these items were not created by just one person. It takes several different engineers working together to create a final product.

Just as building an Olympic stadium requires several types of engineers, it takes many different kinds of engineers to design and build things — a car, for example. Mechanical engineers design the parts, electrical engineers design the electrical system, and chemical engineers create the fuel. It takes all of these people to design vehicles—an example that shows us how teamwork is a big part of engineering.