

INTRODUCING THE DESIGN PROCESS

When engineers solve a problem, their first solution is rarely their best. Instead, they try different ideas, learn from mistakes, and try again. The series of steps engineers use to arrive at a solution is called the **design process**.

INTEGRATE THE DESIGN PROCESS INTO ACTIVITIES

As kids work through a challenge, use the questions below to tie their work to specific steps of the design process.

Brainstorming

- At this stage, all ideas are welcome, and criticism is not allowed. How creative can you be?
- What specific goal are you trying to achieve, and how will you know if you've been successful?
- What are some ways you can start tackling today's challenge?

Designing

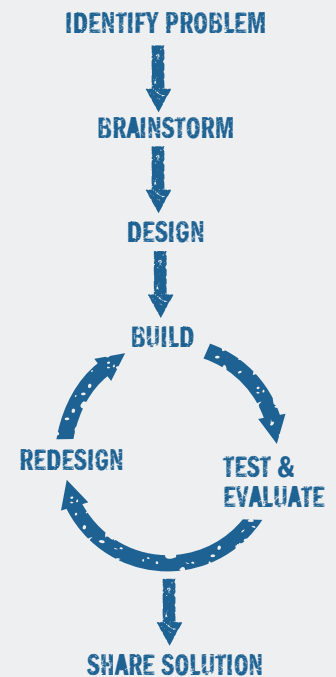
- Time to get realistic. Talk through the brainstormed ideas. What's really possible given your time, tools, and materials?
- It's not cheating to look at other kids' projects. What can you learn by looking at them?

Building, testing, evaluating, and revising

- Does your design meet the criteria for success?
- What is the hardest problem to solve as you build your project?
- Why do you have to do something a few times before it works the way you want?

Sharing solutions

- What do you think is the best feature of your design? Why?
- What are some things everyone's designs have in common?
- What would you do differently if you had more time?
- What were the different steps you had to do to get your project to work the way you wanted?



THE DESIGN PROCESS

The design process is a great way to tackle almost any task. In fact, you use it each time you create something that didn't exist before (e.g., planning an outing, cooking a meal, or choosing an outfit).



Photo: Anthony Tieuli

Design Squad host, Nate Ball, looks at the Purple Team's design sketch before they begin building.

EACH CHALLENGE REINFORCES THE DESIGN PROCESS

Each section of the leader notes and kids' challenge sheets is built around the steps of the design process. Point out to kids that the titles on a challenge sheet are the steps of the design process.

- **Introduce the challenge**—Offers simple demonstrations and presents questions (and answers) about the activity's key concepts. This quick review introduces the activity's important ideas and terms.
- **Brainstorm and design**—Raises discussion questions to help kids think about different ways to tackle a challenge. Since challenges offer kids many ways to succeed, this section helps jump-start their thinking about various approaches and possibilities. At this stage, the more ideas, the better. But before moving to the "build" step, be sure that each kid narrows the list of ideas and settles on something specific to design.
- **Build, test, evaluate, and redesign**—Lists common issues that surfaced when the challenges were field tested as well as strategies to use with kids who are facing these issues.
- **Discuss what happened**—Provides questions (and answers) to review the activity's key concepts and to help kids reflect on how they used the design process in the challenge.
- **For events**—Offers tips on setting up and running the challenge in an event setting.
- **Kids' challenge sheets**—Each section of a challenge sheet correlates with a different design process step. After completing a few challenges, kids see that the design process lets them think creatively about a problem and produce a successful result.

HOW TO REINFORCE THE DESIGN PROCESS WITH KIDS

Open-ended challenges have no single right answer, so kids are inspired to come up with their own solutions. Use these tips to help kids explore!

- As kids progress through a challenge, point out the steps of the design process that they're doing.
- Encourage kids to come up with several ways of solving a problem before they move ahead with one idea.
- Avoid giving too much direction; it discourages kids from thinking for themselves.
- When something fails, encourage kids to try again. Mistakes are opportunities for learning. In fact, the *Design Squad* motto is, "Fail fast—succeed sooner."
- Guide kids by asking questions. To help kids discover answers for themselves, ask: What have you tried? How did it work? Why do you think it didn't work? What else could you do?
- Engineers communicate visually as well as verbally. Have kids keep design notebooks to sketch their ideas and results.
- Engineers present their work to colleagues to show how they solved a problem. You can do the same by reviewing each challenge with your kids.

IF AT FIRST...

...you don't succeed, try, try again. This saying is at the heart of the design process. Testing a design and then revising it based on what you've learned is an important key to success.



Photo: Lauren Feinberg



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As kids progress through a challenge, point out the steps of the design process that they're doing.

TALKING TO KIDS ABOUT ENGINEERING

Few kids can say what engineering is or what an engineer does. Yet once they find out, many are hooked! You can be the one to help a young person discover his or her dream job. As you work with kids, use the information below to talk with them about engineering.

WHAT'S AN ENGINEER?

Engineers dream up creative, practical solutions and work with other smart, inspiring people to invent, design, and build things that matter. They are changing the world all the time.

WHAT DO ENGINEERS DO AT WORK?

Think creatively. Engineering is an ideal outlet for imagination and creative problem solving—the perfect field for independent thinkers.

Work with great people. Engineering takes teamwork. As an engineer, you'll be surrounded by smart, creative, inspiring people.

Solve problems and design things that matter. Engineers improve peoples' lives by tackling problems, improving current designs, and coming up with solutions no one else has thought of.

Change the world and make a difference. Among many other pursuits, engineers develop systems that save lives, prevent disease, reduce poverty, and protect our planet.

HOW DO ENGINEERS MAKE THE WORLD A BETTER PLACE?

Here are some things engineers do to help improve people's lives.

- Create more fuel-efficient cars
- Design a lighter bike frame
- Invent a more powerful superglue
- Create satellites that detect drought around the world
- Develop state-of-the-art cell phones
- Invent artificial retinas for the blind
- Develop a feather-light laptop
- Design clothing that repels mosquitoes

FIND OUT MORE

For more great reasons to become an engineer, fun projects, and profiles of engineers doing innovative work, visit the following Web sites:

- Engineer Your Life at engineeryourlife.org
- Discover Engineering at discoverengineering.org/home.asp

WHAT'S ENGINEERING?

Engineers get to imagine the future and design for it.

Marisa Wolsky, Design Squad Executive Producer

Engineering is about thinking through problems, finding solutions, and helping people.

Daniele Lantagne, Environmental engineer

The best part of being an engineer is the creativity that's involved and the satisfaction that comes from solving hard problems.

Jananda Hill, Computer Science engineer

Every day I see things that could be made better by just applying some good engineering know-how.

Jessica Miller, Biomedical engineer



Photo: Renee Mattier

The Design Squad motto is, "Fail fast—succeed sooner." If a design doesn't work as planned, encourage kids to try again.