

Session 2

The Designed World

Understanding the Design Process



In This Session:

- A) Design Opportunities Are Everywhere (50 minutes)

- Student Handout

- B) Mapping Out a Problem (25 Minutes)

- Student Handout

- C) Design Improvements (30 Minutes)

- Student Handout

- D) SCAMPER and Backpack (45 Minutes)

- Student Handout

Home Improvement

- Student Handout

The Designed World helps build appreciation for the designed world around us and prepares you for finding a design and engineering project. You will learn to identify problems that lead to opportunities for new design solutions and develop skills by thinking creatively about designed things that you use everyday. The first activity, *2A: Design Opportunities Are Everywhere*, involves a short field trip or walking tour to practice recognizing problems and needs around us. The activity ends with developing a list of design opportunities that interest you and that can be used as the first step of your project development. The next activity, *2B: Mapping Out a Problem*, introduces Activity Mapping, a technique used to help you identify problems and design opportunities.

In *Activity 2C: Design Improvements*, learn about and practice a seven-part creative technique for improving existing designs known as SCAMPER. The next activity, *2D: SCAMPER and Backpack*, reinforces generative thinking using the SCAMPER technique with another object, a backpack.

A Home Improvement activity, *Improvement of Everyday Things*, helps you make distinctions between functional and superficial improvements with objects in your own home.

Design Opportunities Are Everywhere

Handout: Session 2, Activity A

Problem identification: What makes a good problem to solve?

Many important engineering and design ideas start with a problem or need. You have the capacity to solve important problems and make amazing things happen. Good ideas are inside you. Good problems often start with things you know about or have some personal connection to. Perhaps it's something that bothers you and you think about how it could be different. Maybe you have a relative or friend who struggles with something. Sometimes a problem to solve just comes from an idea of yours that sounds like a fun or easier way to do something.

In this activity, you will practice identifying design opportunities. Some of these opportunities may be problems, while others may be needs or simple improvements.

Who knows about problems? What kinds of problems are there?

- Health problems: Doctors and nurses would know, researchers too. Safety problems: Emergency room staff would know, firemen and police would know.
- Problems of a specific group: The elderly, the very young, people in wheelchairs, left-handed people, short people, deaf people. Try to understand through experience what it would be like to be in their shoes. Research the associations or organizations of these groups.
- Inconvenient problems: What bugs you? Always losing your keys?

Make a list, in your design notebook, of the people or organizations you could call for more information about problems or things that don't work well enough.

Where can you find problems to solve?

The answer is: everywhere. With attention and focus on designed things you see and use wherever you go, you will see all kinds of problems just waiting for your ideas and creativity. You will be taking a trip today to observe a public place (a mall, a park, or a store). Look for problems to solve. Watch how people use things in that place. Look for problems to solve. Study a few objects and items in that place. Look for problems to solve. Take notes in your design notebook.

What problems would you like to solve?

They can be big problems or small problems. You decide. Creativity takes practice and patience. And it takes a few good strategies. One strategy is called "brainwriting." Brainwriting is different from brainstorming because you don't talk. You write your ideas on paper, quietly.

Write down "problems" or "design opportunities" you are aware of (these may be from the field trip). Include things that exist that could use improvement. Write this list in your design notebook.

Save this list. Revisit it as you work through the other *Design and Discovery* sessions. Add new design opportunities as you think of them.

Mapping Out A Problem

Handout: Session 2, Activity B

Problem Identification and Activity Mapping

As a group, you'll do a practice Activity Mapping on packing for a trip. This is a useful tool for identifying problems. Activity Mapping has four primary user goals that summarize what people are trying to accomplish when engaging in an activity.

Activity Mapping

- 1) Pre-activity: Describes what is done before the activity
- ↓
- 2) Activity: Explains what is involved in the activity
- ↓
- 3) Post-activity: Includes what is involved after the activity
- ↓
- 4) Assessment: Involves how one knows if the activity has been successful

Answer the following questions in your design notebook.

What products are involved in each process?

Are there any problems with any of these products?

What suggestions do you have for improving a product, or inventing a new product?

What could make life easier for people when they pack for a trip?

This process is one way to identify problems and begin to consider solutions.

Now, do your own Activity Mapping, in your design notebook, for a common activity you experience—for example, making a sandwich, washing the dog, or cleaning your room. This process may help you identify a problem or design opportunity. If you identify a problem, add it to the list you began in *2A Handout: Design Opportunities Are Everywhere*.

Design Improvements

Handout: Session 2, Activity C

Ready to SCAMPER? SCAMPER is a technique that gets you to think about improving an existing design. It is an acronym that helps you remember seven different ways to think up new improvements. It is useful for being creative in a systematic way. It generates ideas you might not have on your own. Try it!

S Substitute one thing for another.

C Combine with other materials, things, or functions.

A Adapt: Can it be used for something else?

M Minimize/Magnify: Make it larger or smaller.

P Put to other uses: Can you put it to another use? In this case, use it for another vegetable? If you make it larger, would it work for some other food?

E Eliminate/Elaborate: Remove some part or material, or make one section more detailed or refined.

R Reverse/Rearrange: Flip-flop some section of the item, move parts around.

Here are some improvements that can and have been made to water bottles. Can you think of any more improvements by using the SCAMPER technique?

2C: Design Improvements (continued)

SCAMPER	Questions to Ask	Water bottle Improvement	Benefit
Substitute	What could be used instead? What kind of alternate material can I use?	Different bottle material	Plastic bottle is unbreakable, unlike glass
Combine	What could be added? How can I combine purposes?	Add straw into top	Straw allows access to bottom of water bottle without lifting and tilting bottle
Adapt	How can it be adjusted to fit another purpose? What else is like this?	Use squirt top for watering plants	Directed stream gets water to the plant roots
Magnify	What happens if I exaggerate a component? How can it be made larger or stronger?	Larger bottle	More water for better hydration
Minimize	How can it be made smaller or shorter?	Smaller bottom of bottle	Can store in car's cup holders easily
Put to other uses	Who else might be able to use it? What else can it be used for other than its original purpose?	Turn upside down	Hand washing station
Eliminate	What can be removed or taken away from it?	Eliminate the handle	More volume for water storage
Elaborate	What can be expanded or developed more?	Larger base	Lower center of gravity helps keep water bottle from tipping
Rearrange	Can I interchange any components? How can the layout or pattern be changed?	Move handle from side to top	Better ergonomics for hauling large amounts of water
Reverse	What can be turned around or placed in an opposite direction?	Water spout at bottom	Easier to dispense water into cups

SCAMPER and Backpack

Handout: Session 2, Activity D

The Backpack, Improve It!

Apply SCAMPER to each of the backpack parts. Sketch and make notes about your improvement ideas. Make your drawings in your design notebook.



Improvement of Everyday Things

Handout: Session 2, Home Improvement

Where Do You See Improvement?

The following list represents common items found in most household kitchens, garages, or junk drawers. These items have been specifically designed to serve one need. In some cases, the variety of these items represents improvements in functionality; in others, the variety merely represents aesthetic appeal. Functionality is an engineer's job, and it is important to recognize the difference between "appeal" factor and meaningful improvement in functionality.

Bring three things from this list of items that best represent functional improvement:

- Cheese grater
- Cherry pitter
- Nail cutter
- Cup lids for hot liquids
- Candle holder
- Stapler
- Napkin ring
- Can opener
- Tooth floss container
- Eraser
- Key ring
- Lemon peeler
- Can opener
- Potato peeler
- Umbrella
- Toothpick dispenser

Be prepared to explain the functional improvement.