



# Problem Solved! Design Challenge

by [name]







**1** Follow the Engineering Design Process as you create and work. Always follow safety rules.

## 1 Engineering Design Process

1. Identify a need.
2. Research the problem.
3. Design a solution.
4. Build a prototype.
5. Test and evaluate a prototype.
6. Troubleshoot and redesign. (Circle back through 3-6 until flaws are worked out.)
7. Communicate the solution.

Remember safety!

1 You can do this sample design project, or create your own project and follow these steps.

## 1 SAMPLE DESIGN PROJECT

1 DATE:

1 Engineering Team:

1 The Need: Dirty water is unsafe to drink. Design a two-step model of a water filtration system.

The Problem: What combination of materials filter dirty water best?

We researched the problem of water filtration.

First, we looked at our own town's drinking water.

Our drinking water comes from...

It is monitored for the following contaminants:

...

Before it comes to our tap it passes through a water filtration system...

The filtration protects us from...

Then we looked at other ways to protect drinking water, such as...

Then we solved a smaller problem. We invented a two-step model to filter dirt from water.

This might help us understand what engineers do to solve the bigger problem of polluted water.

**1** Make a drawing or take a photo of this real-world need. Upload here.

**1**

A large, empty rectangular box with a thin black border, intended for uploading a drawing or photograph. The box is currently blank.

**1** List the materials you will need. Add safety rules below. Make sure your engineering team follows them.

## 1 Materials

- dirty water (water mixed with soil)
- 2-liter clear plastic bottle with the bottom cut off
- large beaker
- nylon fabric
- rubber band
- fine sand
- gravel of various sizes
- charcoal
- coffee filter
- fabric pieces

### Safety Tips for this design:

- Work carefully with scissors. Always direct the sharp edge or point away from yourself and others.

**1** Fill out the information as your work on your Design Plan.

Make sketches of your design plan.

Take photos of your materials and set up.

Upload photo here.

## 1 Design Plan

We cut the bottom of the bottle and turned it upside down in the beaker with nylon fabric over the bottle opening, held on by the rubber band wrapped tight.

Next, we decided what materials to place in the bottle to filter the dirty water.

We chose to use layers of:

first, ...

then, ...

then, ...

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*Write in the information about your prototype. What adjustments did you make?*

*Draw or take photos of your prototype. Upload picture here.*

## 1 Prototype

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**We assembled our design.**

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**We made adjustments for...**

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**In the end we had ...(how many?)**

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**layers of filtering materials.**

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Record your test information.

### 1 The Test

To test the filter, we poured a cup of dirty water into the filter and observed. Here's what happened....

How clean was the water in the beaker at the end?

On a scale of 1 for clear water and 10 for dark water that no light penetrates, our water started at... and ended at....

**1** Draw or take photos of your test. Upload picture here.

**1**

**1** Record how you improved your initial design.

Draw sketches of your new design, or draw a diagram of how it works. Upload picture here.

## 1 Troubleshoot and Redesign

We wanted to improve...

We redesigned the system so that it would have a two-step process.

In the two-step model water will be filtered once...

Then the water will pass through...

The new design is shown in the picture.

1

## 1 Communicate

We started with a need or problem and we planned, designed, built, and engineered a technical solution. Here's a short story of what we learned along the way.

Some things that challenged us were...

It was interesting to see that...

One thing that we didn't expect was...

To make our solution really work well, it would need...

One question about water purification that puzzles us now is...

One thing we learned about design was...

**1** A final picture (or pictures) of your crew and creation! Upload your drawing(s) and/or photo(s) here. Add a caption below the picture.



**2** Add a caption or captions to the picture(s).

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**1** Create your own design project, following the steps for the water filtration test.

## **1 OUR DESIGN PROJECT**

**DATE:**

**Engineering Team:**

**The Need:**

**The Problem:**

**We researched the problem in our lives.**

**First we....**

**Then we...**

**Then we...**

**This might help us understand...**

**1** Make a drawing or take a photo of this real-world need. Upload here.

**1**

A large, empty rectangular box with a thin black border, intended for uploading a drawing or photograph. The box is currently blank.

**1 Materials:**

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**1 Safety Tips for this design:**

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- 1** Make sketches of your design plan.  
Take photos of your materials and set up.  
Upload here.

## 1 Design Plan

First, ...

Next, ...

Next, ...

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Draw or take photos of your prototype. Upload here.

## 1 Prototype

We assembled our design.

We made adjustments for...

In the end we had...

1

## 1 The Test

To test the prototype, we....

Here's what happened....

**1** Draw or take photos of your test. Upload here.

**1**

**1** Draw sketches of your new design, or draw a diagram of how it works. Upload here.

## **1** Troubleshoot and Redesign

**We wanted to improve...**

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**We redesigned the system so that . . .**

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**The new design is shown in the picture.**

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**1**



## 1 Communicate

We started with a need or problem and we planned, designed, built, and engineered a technical solution.

Here's the short story of what we learned along the way.

Some things that challenged us were...

It was interesting to see that...

One thing that we didn't expect was...

To make our design work really well, it would need...

One question about this topic that puzzles us now is...

One thing we learned about design was...

*Add pages as needed to this book.*

- 1** *A final picture (or pictures) of your crew and creation! Upload your drawing(s) and/or photo(s). Write a caption for your picture.*

1

**2** Add a caption or captions to the picture(s).

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