

# Chair Challenge

[design challenge to address the needs of users]



## KEY

This activity allows learners to more deeply explore the Engineering Design Cycle (define, develop, and optimize). In particular, this activity focuses on assessing needs.

Engineers must carefully determine the needs of people for whom they are solving a problem. Knowing user needs allows the engineer to accurately define the problem and develop an appropriate solution. Then, engineers get feedback from users to optimize (improve) the design. When engineers don't take needs into account, products can end up not working or even become dangerous.

In this activity, learners will play both “client” and “engineer” as they design a chair for one of the Through My Window characters.

## Activity Parts

### Recommended set-up:

Each student will have two roles: 1) their role as a client based on their identity as a Through My Window character, and 2) their role as an engineer designing for their client (partner). Each student designs a chair, and has a chair designed for them (as a character). This method allows students to give feedback to each other from the perspective of the character they are assigned.

### Alternate set-up:

This is a simplified version, where each student only has one role: design a chair for the character they are assigned. The student can still receive feedback from a partner, and/or from a teacher.

[This activity was inspired by the d.School's 5 Chairs Exercise activity]

# PART A



## Big Idea for Kids

Today we will do an activity where you get to design and build a chair for one of the Through My Window Characters, like Sadina or Rio. You will use the steps in the Engineering Design Cycle to create your chair (define, develop, & optimize). We've been talking about how an important part of defining the problem is understanding the needs of users. Engineers need to know people's needs because otherwise they can put a lot of time, energy, and money into building something that either isn't actually useful or doesn't solve the problem. In this activity, each character has different needs for their chairs. For example, some need their chair to be really comfortable, whereas some need their chair to have a lot of storage space.

## Getting Ready

### Time Estimate

45-60 minutes

### Materials

Chair Challenge Worksheet

Chair Challenge Character Cards

Building materials

Recommended: modeling clay for each student, popsicle sticks, toothpicks, pipe cleaners

### Preparation

Make enough copies of worksheet

Cut out the necessary amount of character cards (each student gets one)

Set up available building materials so they are accessible to students

# Activity Instructions

## 1 INTRODUCTION (3 min)

Distribute a worksheet to each student & Read aloud the Big Idea for Kids.

Then, tell students:

Each of you will have two jobs. You will each be a client, and an engineer. Your partner will design a chair for you, and you will design a chair for your partner. When you design a chair for your partner, you will actually be designing for the character they are assigned. So for example, if your partner has a Sadina card, you will design a chair for Sadina. If you have a Rio card, your partner will design a chair for Rio.

We will start by having time to define the problem and develop some possible solutions. Then you will have 20 minutes to build a prototype of your chair using clay and other materials. Then your partner will give you feedback on your design. You will write down their feedback, and then modify your design based on the feedback you get. Finally you will write a reflection on your experience. Any questions?

## 2 DEFINE (5 min)

Pass out the character cards. Each student gets one card, and should have a different card than their partner. Tell students to read the description of their character, and then switch and read the card for their client (partner). They will write the name of their client (their partner's character name) on their worksheet. Then, based on the description, they will identify two needs of their client and write them on the worksheet.

## 3 DEVELOP (5 min)

Students will brainstorm and sketch ideas for how to design a chair that meets the needs of their client. Encourage wild ideas! The point of this activity is to practice coming up with creative solutions, rather than necessarily being realistic. (Students will often add jetpacks to their chairs -- that is fine, as long as they serve a purpose.)



## Open the Window

What's something you use every day and how does it meet your needs? Could it be improved to do a better job of meeting your needs? What's a need that you have that you wish you had a solution for?

## 4 OPTIMIZE

Once students have developed their chair design, they will complete the three phases of optimizing their chair design.

- **PROTOTYPE (20 min)**

Using the materials available, students will construct a prototype of their chair. We suggest projecting a countdown timer on the board so students know how much time they have left. Make an announcement when there are 10 minutes left, 5 minutes left, and 1 minute left (until it's time to present their prototype to their client!)

- **FEEDBACK (3 min)**

Partners share their designs with each other. They should describe the features of their design, and how it meets the client's needs. Each client should provide three positive comments, and three suggestions that could make the design even better. (Sometimes it's hard for students to come up with three of each, but encourage them to come up with at least two for each). We encourage role play, and for clients to provide feedback as if they are the character. Students should practice good listening skills, and write down the suggestions their partner tells them.

- **REDESIGN (5 min)**

Students will have five minutes to modify their chair prototypes based on feedback they received from their partner. If students finish early, they can begin the reflection.

## 5 REFLECTION (5 min)

Students should answer most of (or all) of the suggested questions. Feel free to provide additional paper, or make this a homework assignment. If you would like to extend this activity, consider having students make an advertisement for their chair.



View from my  
Window

How does your chair meet the needs of your user?  
Did your ideas change along the way?  
How would your chair have been different if you didn't know your user's needs?

Name \_\_\_\_\_

# Chair Challenge

**Goal:** Design a chair for your client that meets their needs.

**Name of my client** \_\_\_\_\_

## **DEFINE** the problem

- My client wants a chair that meets their needs. The chair should:

- (need #1) \_\_\_\_\_

- (need #2) \_\_\_\_\_

## **DEVELOP** solutions

Sketch your wild ideas! Draw at least 3 different options. Then circle your favorite.

## **OPTIMIZE** your solution

### **PROTOTYPE**

Build a prototype (first model) of your design by using the materials provided

### **GET FEEDBACK**

Show your prototype to your client. Write down their feedback.

**Positive comments:**

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

**Suggestions to make it even better:**

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

### **REDESIGN**

Use your client's feedback to redesign your chair.

### **Reflection Questions**

How did you include the needs of your user? Did your ideas change along the way?

Did you get stuck at any point? What did you do to get unstuck? Which materials did you like best?

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**Sadina**



Sadina is an athlete who hates to sit still. She has basketball practice every night, and always comes home with sore muscles from all that exercise. After practice, Sadina likes to sit at the kitchen table to do her homework and write short stories, but she thinks the kitchen chairs are very hard and uncomfortable.

**Rio**



Rio is an active computer user. He spends several hours each night fighting virtual monsters, listening to music, and designing buildings. Rio likes to keep his guitar near his computer, but sometimes he accidentally knocks it over. Rio often becomes so focused on what he's doing that he forgets to eat dinner and ends up very hungry before bedtime.

**Catalina**



Catalina is a student and spends 7 hours a day sitting at school. Her backpack is loaded with school books, video games, photographs of her cat, and travel souvenirs. Catalina's stuff always spills out of her backpack and piles up around her seat. She frequently gets in trouble for talking to her friends during class.

**Carl**



Carl is a toddler who likes to explore. Whenever his sister Catalina turns her back, Carl immediately gets into mischief. He has broken ten flower pots in the past month, and is responsible for the disappearance of many boxes of cookies. His sister wishes Carl could have a way to stay entertained before he ends up building a time machine (or something worse).

**The Mayor of Chicago (1893)**



The Mayor of Chicago is an elderly man with back pain. He sits at a desk all day planning for the World's Fair, and it's hard for him to get in and out of his chair on his own. He likes to read books about ostriches and draws pictures of his favorite birds.

**Monica**



Monica is a busy student. Carrying a heavy bag full of supplies for chorus, cheerleading, and environmental club often makes her late to where she needs to be. Monica is very organized and being on time is important to her, so she wishes she could get through the hallways faster.