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UPLANDS

PROUD PARTNER

Grade K-2 STEM Challenge

# You Can Fix It

Inspired by maintenance technician careers in the  
Indiana Uplands.



Published by Regional Opportunity Initiatives

## GRADE K-2 STEM CHALLENGE

# You Can Fix It

Inspired by maintenance technician careers in the Indiana Uplands.

Students will identify problems on their playground and design a plan to improve them.



## CAREER CONNECTION AND LESSON OVERVIEW

Maintenance technicians don't only repair things when they break down; they also routinely inspect and maintain equipment to prevent problems. Communication skills and teamwork are essential for this position. When equipment breaks down, maintenance technicians work with other team members to diagnose the problem and get things back up and running as soon as possible. These professionals use electrical schematics, mechanical blueprints, and their in-depth knowledge of the equipment to find and fix problems.

Maintenance technicians have to be able to not only see problems but devise a plan to fix them. Students will tour their school playground to find equipment that needs to be repaired or improved and develop a plan to do so.

## LESSON TIMELINE

DAY 60 Minutes

1

- Show the inspiration video, "Charlotte Fixes Everything"
- Introduce the career of maintenance technicians
- Playground inspection tour and problem selection

DAY 60 Minutes

2

- Introduce the Engineering Design Process
- Imagine solutions and make a plan

DAY 60 Minutes

3

- Construct a paper or cardboard model of the proposed playground solution
- Improve model design
- Plan a report to share their improvement plan with the school

DAY 60 Minutes

4

- Communicate the improvement plan

## Recommended Supplies

For the class:

- A variety of building and art supplies, including:
  - Paper
  - Cardboard
  - Tape
  - Crayons and/or markers
  - Glue
  - Rulers

For each student:

- Pencil and paper
- KWL handouts
- Student EDP Planning handout





## IN THIS CHALLENGE, STUDENTS WILL:

- Take a walking tour of the playground to identify problems that need to be solved.
  - Brainstorm ways to fix those problems and who could help.
  - Develop a presentation to communicate solutions.
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## Standards

### Science & Engineering Process Standards

SEPS.1 Posing Questions (for science) and defining problems (for engineering)

SEPS.2 Developing and using models and tools

SEPS.6 Constructing explanations (for science) and designing solutions (for engineering)

SEPS.8 Obtaining, evaluating, and communicating information

### Engineering Standards

K-2.E.2 Develop a simple sketch, drawing, or physical model to illustrate and investigate how the shape of an object helps it function as needed to solve an identified problem.

### Science Standards

K.PS.3- Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.

### English/Language Arts

K.SL.3.1 Ask and answer questions about key details in a text read aloud or information presented orally or through other media.

1.SL.3.1 Ask and answer questions about key details in a text read aloud or information presented orally or through other media.

2.SL.3.1 Determine the purpose for listening (e.g., to obtain information, to enjoy humor) and paraphrase or describe key ideas or details from a text read aloud or information presented orally or through other media.

### Math Standards

K.M.1 Make direct comparisons of the length, capacity, weight, and temperature of objects, and recognize which object is shorter, longer, taller, heavier, warmer, cooler, or holds more.

1.M.1 Use direct comparison or a nonstandard unit to compare and order objects according to length, area, capacity, weight, and temperature.

1.DA.1- Organize and interpret data with up to three choices; ask and answer questions about the total number of data points, how many in each choice, and how many more or less in one compared to another.

# Planning and Implementation

## YOU CAN FIX IT

### Essential Vocabulary

- **MAINTENANCE:** the process of maintaining, fixing, or preserving something.
- **ENGINEERING DESIGN PROCESS:** A series of steps that a student or engineer follows to come up with an optimal solution to a problem.
- **PROTOTYPE:** a first model of something from which other models are developed or copied.

### In this challenge, students will:

- Take a walking tour of the playground to identify problems that need to be solved.
- Brainstorm ways to fix those problems and who could help.
- Develop a presentation to communicate solutions.

### Day 1

#### Introduction and Field Trip (60 minutes)

Begin the conversation about maintenance by building personal relevance. Ask students:

*"What happens when things break or aren't working correctly? We can throw broken things away or we can try to fix them. Maintenance technicians keep factories working by repairing equipment when it breaks down or improving it so it works better. What are some examples of things you've had to fix or improve?"*

Show students the video "Charlotte Fixes Everything", available at <https://regionalopportunityinc.org/charlotte/>. Prompt students to think about what it means to "maintain" things and keep them in working order. What happens to items over time? Why do they break? How do people fix them?

Divide students into teams of 3 to 4 and take them outside to their playground with their STEM notebooks or blank paper and a pencil. Ask students to spend 15 minutes walking around their playground looking for problems to solve or improve.

"Problems" on the playground could include any number of things, including:

- Bad drainage or constantly muddy areas
- Broken equipment
- Uncomfortable equipment (slides that get too hot in summer, short swings, etc.)
- Missing equipment
- Equipment that is difficult to use or access.

Students should record the issues they find on the playground in their notebooks or on paper (they can also take photographs). Remind them not to try to fix these problems now-- they are only creating a list of things that need to be improved. Once students have collected a list or set of pictures, return to the classroom create a class list of problems that need solving. Determine the three most pressing issues or the three projects students feel most excited about. Write these in a place where all students can see them.

## Day 2

### Introduce the Engineering Design Process

Begin the day by reframing the challenge with a discussion of the three problems the students selected on day 1. Form student teams to work on each topic. Students will first gather with team members during the PLAN stage on day and CREATE on day 3.

Guide students in a discussion about what they KNOW about how they might fix the problem they chose. What needs to be done? Who might be able to help? Complete the KNOW section of the Know, Wonder, Learn (KWL) chart with the class. Students may do individual KWL charts (included, page S1) if preferred.

Introduce the KWL chart and record student responses to the discussion questions:

- What do we KNOW about our playground problem? (K)
- What do you WONDER about how it can be fixed (W)?
- What do you need to LEARN to be able to solve the problem (L)?

## The Engineering Design Process

Tell the students that, like Charlotte in the video, fixing a problem on the playground will require them to use an ordered approach to find solutions. Another word for “designing a solution” is “engineering.” Engineers find ways to solve problems or fix items to make them work better. They use the Engineering Design Process (abbreviated EDP) to do this.

Introduce the steps of the Engineering Design Process (EDP). Use the graphic (page S2) to illustrate the EDP for the students. Provide copies of this handout if needed.

Explain that they will be using the EDP to design a solution to their playground problem and create a physical model of what they want to change or repair.



### Ask and Imagine

Prompt students to fill out the ASK section of their Student Data Sheet with their selected problem. For example:

- *"How could we design a way to keep the slides cooler in the summer?"*
- *"How could we redesign the merry-go-round so students who use wheelchairs can use it?"*
- *"How could we keep the area under the swings from getting so muddy when it rains?"*

Ask students to brainstorm possible solutions to the problem they chose individually before joining a group. Have them record their ideas in the IMAGINE section of their Student Data Sheet.

## Plan

Have students review the ideas they developed in the IMAGINE section and decide on their best approach. Remind students that when working in a group you have to take turns sharing your ideas so that good ideas are not lost. Introduce students to the options available to build their solution model but allow students time to PLAN out their playground improvement models before they can collect their materials. Allow students at least 30 minutes to develop their plans.

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## Day 3

### Create and Improve (60 Minutes)

Revisit the Engineering Design Process handout and remind students of the steps and where they are in the cycle. They have ASKED, IMAGINED, and PLANNED and now it is time to CREATE.

Once students have settled on a PLAN, students will work in their groups of 3-4 to create the model for a solution. Students will create a model of their playground solution using paper, cardboard, tape, glue, crayons, and other art supplies. Introduce students to the options available to build their solution model but allow students time to PLAN out their playground improvement models before they can collect their materials. Encourage students to draw out their ideas on the Student Data Sheet or in their STEM notebooks before getting started.

Model construction may take more than one day, depending on how students are working. Time on task is at the discretion of the teacher. Students will find that they will want to redesign and refine their models as they work.



## Day 4

### Communicate (60 Minutes)

The goal of this activity is for students to not only develop a plan to improve their school's playground but also share their ideas with their class and beyond. Sharing their designs should include:

- An explanation of the problem they wanted to solve.
- How their planned repair or redesign would fix it.
- One thing that went really well about this challenge.
- One thing that was difficult about this challenge.



### Career Exploration and Extension

To extend this activity and emphasize student voice and choice, educators may choose to invite school leadership, such as the principal or school board, to hear students' ideas for improving the playground.

Prompt students to think about and research what a career as a maintenance technician might entail.

- What does a maintenance technician do all day?
- What kinds of problems do maintenance technicians solve?
- What kind of training would a student need to have a job fixing problems and keeping things running smoothly?

If time allows, show students the video "Nick - Maintenance Technician" available at <http://regionalopportunityinc.org/nick>



Name: \_\_\_\_\_

# You Can Fix It

Know, Wonder, Learn Chart

KNOW	<div></div> <div></div> <div></div> <div></div> <div></div>
WONDER	<div></div> <div></div> <div></div> <div></div> <div></div>
LEARN	<div></div> <div></div> <div></div> <div></div> <div></div>

# You Can Fix It

## Engineering Design Process Cycle



Name: \_\_\_\_\_

# You Can Fix It

## Student Data Sheet

### ASK

What is the problem we are going to solve?

Our biggest playground problem is

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### IMAGINE

Brainstorm solutions to the problem above.  
Record your ideas in words or pictures.

Name: \_\_\_\_\_

<b>PLAN</b> Create a blueprint of the prototype you will build. What materials will you use?	<b>CREATE</b> You will have _____ minutes. Use this time to build the prototype you planned.
<b>IMPROVE</b> Edit the prototype that your group made.	
<p>What did you change?</p> <p>-----</p> <p>-----</p> <p>-----</p> <p>Why did you change it?</p> <p>-----</p> <p>-----</p> <p>-----</p>	



Name: \_\_\_\_\_

## COMMUNICATE

Share your prototype with the class or another group.

What went well during this STEM challenge?

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What part of this STEM challenge was difficult?

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I learned \_\_\_\_\_

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# ACKNOWLEDGEMENTS

Activities developed and written for Regional Opportunity Initiatives by

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## IMAGE AND CONTENT CREDITS

### Images

Stock photography courtesy of Canva.com

Still video images from "Charlotte Fixes Everything," available at <http://www.regionalopportunityinc.org/charlotte>

A photograph of two children running across a grassy yard. In the foreground, the back of a child with long brown hair wearing a pink shirt and a light blue skirt is visible. In the background, another child with long brown hair, wearing a dark blue shirt and light blue jeans, is running away. A wooden fence and a colorful playground structure are in the background.

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**ROI**

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