TABLE OF CONTENTS

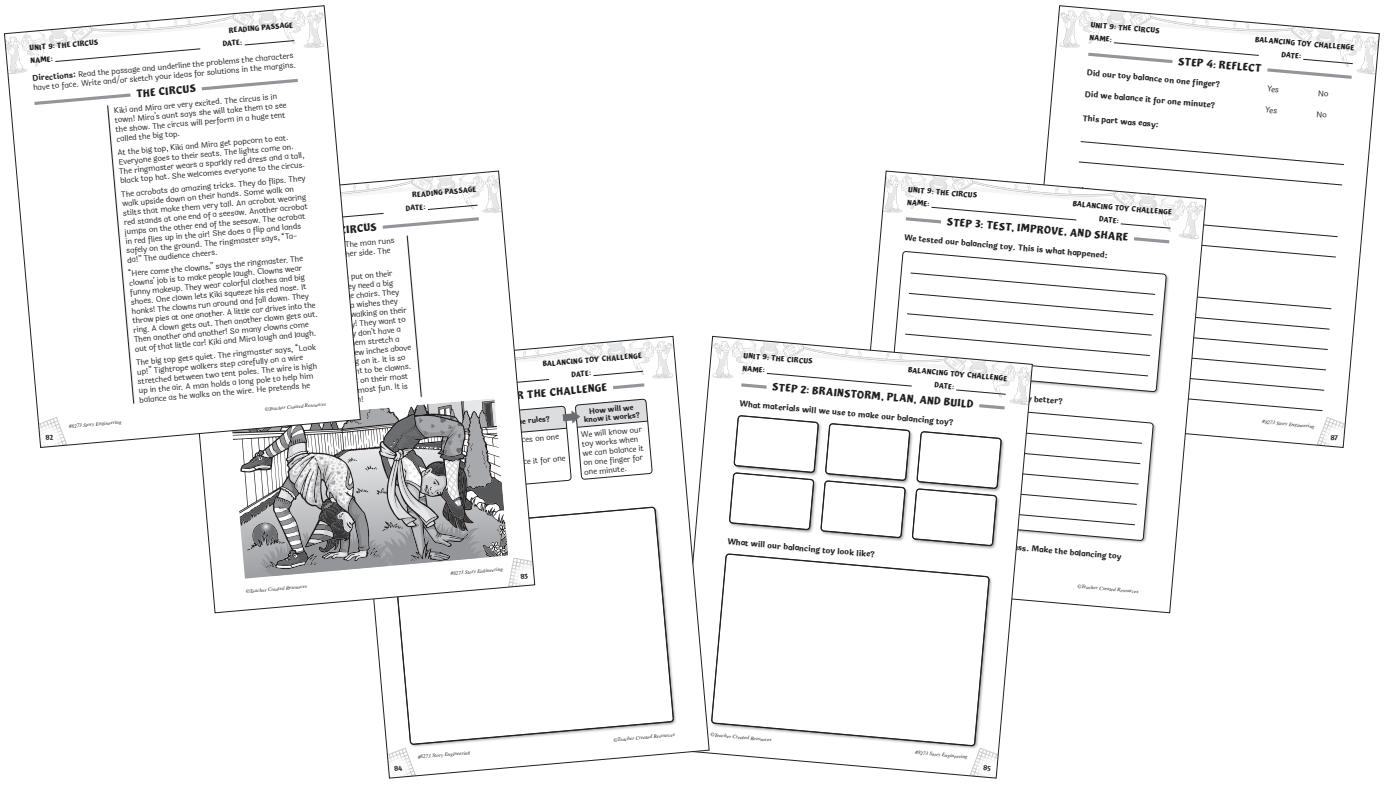
INTRODUCTION

This book will help you implement engineering design challenges in your classroom by using stories as an entry point. This interdisciplinary approach helps students contextualize engineering and design concepts, and they will get excited about engineering!

The stories are fun and engaging and have been specifically developed to include several problems—some obvious and some not so obvious. Students read a story and look for and discuss the problems they find, which encourages them to reread and analyze the text of the story. Once students have chosen a problem, they work in teams to define what they need to create to solve it. Teams then use the engineering design process to plan, build, test, and improve their solution using recycled materials and common supplies. Finally, students reflect on their experience through drawing and writing. This integration of literacy and STEM allows students to acquire and practice skills in both areas.

In these engineering challenges, you will be putting materials in the hands of students, setting them up for success, and turning them loose to create and build. You become a facilitator—scaffolding when necessary; providing guidance; and checking in with groups to offer encouragement, advice, correction, and support. Motivate students to help one another, both within teams and between teams.

There may be a bit of a learning curve at first, but once students understand how engineering challenges work, they really dive into them. They become fully engaged in working together on their own terms, manipulating materials and solving a compelling problem, with their hands and minds occupied and on task. And these challenges are not conducive to silence; a low buzz of purposeful conversation indicates that students are actively engaged. Your biggest problem may be getting them to wrap things up!



PLOT SUMMARY:

Jada and Tariq's older sister won't let them play with her toy car track, so they make their own. They experiment with a ramp to make their cars roll farther. They figure out how to keep the cars from rolling off the track, and they build a jump.

RAMP CHAMPS CHALLENGE:

Problem What problem will you solve?	Challenge What will you do?	Rules Criteria: What must the solution do to be successful? Constraints: What are the limits?
The kids want the car to roll all the way down the track.	Build a ramp that makes a toy car roll at least three feet.	• The ramp stands on its own. • The car goes without being pushed. • The car rolls safely down the ramp. • The car rolls at least three feet from the bottom of the ramp.

OTHER POSSIBLE PROBLEMS AND CHALLENGES:

Students can use the *Universal Challenge Pages* (pages 106–109) to create solutions to any of the problems below or problems they identify themselves.

Problem	The kids need to keep the cars from rolling off the track.
Possible Challenge	• Design and build a track that keeps the cars from rolling off.

Problem	The kids want to make cars jump.
Possible Challenge	• Engineer a ramp to make cars jump as high as possible.

Problem	The kids want to build a bridge for the cars to roll over.
Possible Challenge	• Design and build a track with a bridge.

Problem	The kids want to build more fun ways to play with cars.
Possible Challenge	• Design and build more items, such as a parking lot, garage, car wash, or street signs.

NAME: _____ DATE: _____

Directions: Read the passage and underline the problems the characters have to face. Write and/or sketch your ideas for solutions in the margins.

TOY CAR TRACK

"But why?" asked Jada.

"We want to play, too!" said Tariq.

Their older sister shook her head. "No. I don't want you to mess up the track. You might crash the cars," she said.

Tariq and Jada walked away. They were sad. They really wanted to play with the toy car track.

"I know!" said Jada. "Let's build our own track!"

"We have some old cars in the toy box," said Tariq.

They ran to the toy box. They dug through all the toys. They found five cars.

"What will we use to build our track?" asked Tariq.

They looked around. Jada grabbed some books. She stacked up four books. Then she laid one end of a big book against the top of the stack. The other end was on the ground. She put a car at the top of the ramp. She let it go. It rolled down and stopped at the bottom.

They asked Mama for some empty boxes. She gave them a cereal box and some plastic tubs. Tariq cut the cereal box into strips. He taped them together at the ends. It made a long track! They put the track at the bottom of the ramp. They let a car go down the ramp and it rolled about halfway down the track.

"How can we make it go farther?" asked Tariq.

Jada put another book on the stack. It made the

NAME: _____ DATE: _____

STEP 1: PREPARE FOR THE CHALLENGE

What will we do?	What are the rules?	How will we know it works?
We will make a ramp for a toy car to roll down.	• The ramp stands on its own. • The car goes without being pushed. • The car rolls safely down the ramp. • The car rolls at least three feet from the bottom of the ramp.	We will know our ramp works when a car rolls safely down it and travels at least three feet without being pushed.

What do we know about this?