Unit 3: Is It Strong?

KIDSPARK
EDUCATION

Primary Unit Objective:

Introduce students to one of the primary tasks of engineering: making things strong.

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Recommended Grade Level:
PreK - 1st

Mobile STEM Lab Required:
ROK Blocks (1 per group of 4 students)

# of Lessons Included:
4

Developing STEM Identity:

In this unit, students expand on their growing understanding of engineering and what it means to be an engineer. The activities engage them with a real-life problem that often faces engineers: how to make things strong. Students also learn part of the design cycle by testing their designs and improving them.

Alignment to STEM Standards:

Unit 3 focuses on a specific engineering problem - making things strong - and explores different ways to improve strength. The unit also expands student's skills using ROK Blocks by introducing the use of additional engineering materials. The table below outlines the Student Learning Objectives (SLO) for Unit 3 and their alignment to the Next Generation Science Standards (NGSS) and the Common Core State Standards in Math.

Unit Learning Objectives	NGSS DCI	NGSS SEP	NGSS CCC	CCSS-MA
SLO 1: Manipulate ROK Blocks to build increasingly complicated structures.	Developing possible solutions	Developing & using models	Structure & function	Combine different shapes to make an object or design
SLO 2: Explore a specific problem engineers often face (how to make things stronger).	Defining/engineering problems	Asking questions & defining problems	Structure & function	
SLO 3: Understand that pushes on objects can have different strengths and that bigger pushes cause bigger changes in the object.	Pushes/pulls on objects have different strengths	Designing solutions	- Scale, proportion, & functionality - Cause & effect	
SLO 4: Match 3-dimensional objects to 2-dimensional pictures.				Recognize 3D objects in 2D pictures
SLO 5: Test constructions for strength; Try to improve strength by using different designs.		Planning & carrying out investigations	Scale, proportion, & quantity	
SLO 6: Recognize symmetry.			Patterns	Begin to use relational language of right & left

Unit 3 Lesson Overview:

Lesson 1: How Much Load Can It Hold? (30 min.)
In this lesson, students will explore what it means for something to be strong and the relationship between weight, strength, load, and reinforcement.

Lesson 2: The Long Haul (30 min.)
In this lesson, students will explore how to make things strong. Students will discuss how to make "work" easier as they build, test and improve a flatbed truck.

Lesson 3: Make Your Castle Strong (30 min.)
In this lesson students will use their new engineering skills to build and test a castle wall, and then improve on the design to make it stronger. Then, students will move into a "focused" free build, where they create, test, and improve their own castle wall design.

Lesson 4: Free Build (30 - 40 min.)
In this lesson, students are free to create something of their own design. Students can use the skills they have learned throughout previous lessons to build and improve a custom design.

Target Vocabulary

Beam	Test
Bridge	Vehicle
Energy	Work
Force	
Joint	
Load	
Machine	
Pull	
Push	
Reinforce	
Reinforcement	
Strong(er)	

Classroom Organizational Tips

All the lessons in Unit 3 can be taught to the whole class (with or without older student facilitators) or in teacher-facilitated small groups. The lessons are designed to be implemented with small groups of students seated around a shared table. At times it is helpful to have students work in pairs, sharing their observations with their partner. When students use a ROK Blocks Lab, there should be no more than 4 students using each lab.

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Visit our community page at **KidSparkEducation.org/Community** for new project ideas, lesson insights, and to see how other educators are using KidSpark materials and resources in their classrooms.

Recommended Children's Literature

"Building Bridges" (Young Engineers) by Tammy Enz

"Go! Go! Go! Stop!" by Charise Mericle Harper