

Sandra Lee's 5E Integrated STEM Lesson Plan

Topic, Grade Level, Time

3rd Grade: Reporting Category 2

TEKS 3.6 (A) Explore different forms of energy, including mechanical, light, sound, and heat/thermal in everyday life.

Standards

<p>Planning and Carrying Out Investigations</p> <p>Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.</p> <ul style="list-style-type: none">• Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.	<p>PS2.A: Forces and Motion</p> <p><u>The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. (Boundary: Technical terms, such as magnitude, velocity, momentum, and vector quantity, are not introduced at this level, but the concept that some quantities need both size and direction to be described is developed.)</u></p>	<p>Patterns</p> <p>Patterns of change can be used to make predictions.</p>
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CCSS.MATH.CONTENT.3.MD.A.1

Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram.

CCSS.MATH.CONTENT.3.MD.B.3

Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. *For example, draw a bar graph in which each square in the bar graph might represent 5 pets.*

CCSS.MATH.CONTENT.3.MD.B.4

Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters.

Engaging Contexts

Students love to turn trash into treasure and who would not like to build and test a new toy? Let's set up a challenging activity with defined constraints. The activity will be the Balloon Car Challenge. This is intended to be the culminating activity for the Energy Unit.

Justification

The students will use the design process to brainstorm, design and build a balloon powered car that will travel at least 30 cm in a straight line. Through the activity, the students will be able to demonstrate an understanding of force, motion and energy and their relationships. They will use their skills in data analysis and measurement to integrate their math skills.

Measurable Objectives

The students will use the design process to brainstorm, design and build a balloon powered car that will travel at least 30 cm in a straight line. Through the activity, the students will be able to demonstrate an understanding of force, motion and energy and their relationships.

Lesson Procedure

Engage (Day 1 – 45 minutes):

Read one or more of the following books to get the students excited about engineering, design and ideas.

- **The Most Magnificent Thing** by Ashley Spires
 - Reference http://www.kidscanpress.com/sites/default/files/products/assets/MostMagnificentThingThe_2177_teaching_2.pdf for discussion ideas and activities (particularly activity 2 on Perseverance)
- **What Do You Do With An Idea?** By Kobi Yamada
 - Reference <http://schools.nyc.gov/NR/rdonlyres/35C1809B-B30D-450E-AE7C-1F399C7CA5AF/175763/whatdoyoudowithanideamatrix.pdf> for comprehension questions, or
 - <https://www.teachingchildrenphilosophy.org/BookModule/WhatDoYouDoWithAnIdea> for discussion questions
- **Rosie Revere, Engineer** by Andrea Beaty
 - Reference https://www.andreabeaty.com/uploads/1/5/2/4/15240358/rosie_revere_event_kit_v2.pdf for discussion questions and additional activities

Explore (Day 2 – 45 minutes):

- Watch some videos on balloon car challenges, such as pbskids.org/designsquad/video

- Talk about the design process and the constraints, explore the different materials available for the body, axle and wheels.
 - **Identify the Problem, Brainstorm, Design, Build, Test & Evaluate**

Explain (Day 3 – 45 minutes):

- Ensure that students understand the following:
 - Energy is the ability to do work.
 - Work is done when a force moves an object through a distance. In this activity we will be looking specifically at Mechanical Energy which is associated with the motion and position of an object.
 - An un-inflated balloon does not store any potential energy, however an inflated balloon stores potential energy.
 - The potential energy inside the balloon is converted to **kinetic energy**, or energy of motion, when the air is released through the opening. Because the air is pushed out rapidly *backwards*, there is a **reaction force** that pushes the balloon *forward*. **Newton's third law of motion**, states "for every action, there is an equal and opposite reaction."

Elaborate (Day 4 – 45 minutes):

- Build growth mindset and perseverance by sharing some quotes as they work through the redesign and testing
 - <https://www.thinkthroughmath.com/growth-mindset-quotes/>

Evaluate (Day 5 – 45 minutes):

- Redesign, Build, Test & Evaluate, and Share Solutions
- Create Data Tables

Assessment/Rubric

	3 points	2 points	1 point
<i>Distance Traveled</i>	30+ cm	20-29 cm	<20 cm
<i>Straight Line</i>	Yes		No
<i>Can explain the relationship between force motion and energy</i>	Yes		No
<i>Can identify the source of the potential and kinetic energy of the balloon car</i>	Yes		No
<i>Data Analysis: Created a data chart</i>	Has all its	Missing one	Missing

	<i>components</i>	<i>component</i>	<i>more than 2 components</i>
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Lesson Materials	Science Journal	<u>Power</u>	<u>Body</u>
	pbskids.org/designsquad/video	Balloons	<i>Plastic Bottles</i>
	Design Process Poster (..\Downloads\the-design-process-poster.zip)	Rubber bands	<i>Snack Size Cereal Boxes</i>
		Straws	<i>Carboard Tubes</i>
	The Most Magnificent Thing by Ashley Spires	Tape	
	What Do You Do With An Idea? By Kobi Yamada		<u>Testing</u>
	Rosie Revere, Engineer by Andrea Beaty	<u>Wheels</u>	Meter Stick
		<i>Bottle Caps</i>	Guidelines “lanes”
	<u>Axles</u>	<i>CDs</i>	
	Straws	<i>Round Mints</i>	<u>Attaching Materials</u>
	Skewers	<i>Cardboard Circles</i>	Glue
	Lollipop Sticks		Tape
			Playdough