Engineer Physical Science Excitement in Your Classroom with a Carolina STEM Challenge®

CAROLINA
UNLEASH LEARNING

Patti Kopkau
Retired

- 30+ years teaching experience (Middle & High School)
- Enjoys a good science pun
- Carolina Consultant for over 20 years

Workshop Overview

Carolina STEM Challenge® Subject Areas

- Physical Science
- Emerging Energies
- Life Science
- Chemistry

Today's Challenges

- Chemical Rockets
- Balloon Race Cars

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Learning Context

- **Elementary School**
  - General science and inquiry
- **Middle School**
  - **Physical Sciences:** Energy transformations, forces and motion, and mathematical models
- **High School**
  - **Physical Science:** Energy transformations, Newton’s laws, forces, and mathematical models
  - **Physics:** Energy transformations, Newton’s laws, forces, and mathematical models
  - **Earth and Space Sciences:** Power generation, alternative energies
- **Science Competitions**
  - Science fairs
  - Science Olympiad
  - Science and engineering competitions and projects

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Carolina STEM Challenge® Kits

- **Warm-ups and demonstrations**
- **Science content (teachers and students)**
- **3-Dimensional Learning**
- **Notebooking and differentiated instruction**
- **Grading and scoring rubrics**
- **Real-world connections**
- **Extensions (literacy and STEM activities)**

Designed with ease of use in mind, Carolina STEM Challenge® kits have the materials and information needed for classroom success!

Workshop Rules

Safety

- PPE
- Latex

Liquids and Rocket Spray

- Clear tabletops
- Stow electronic devices

Stations

- Find a partner
- Share tool kits
- Keep your work space clean

HAVE FUN!

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Building Toward 3-Dimensional Learning

Chemical Reaction Rockets

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
• Developing and using models: Develop a model to describe unobservable mechanisms.	**PS1.B:** Chemical reactions: Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants.	• Systems and system models: Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales.

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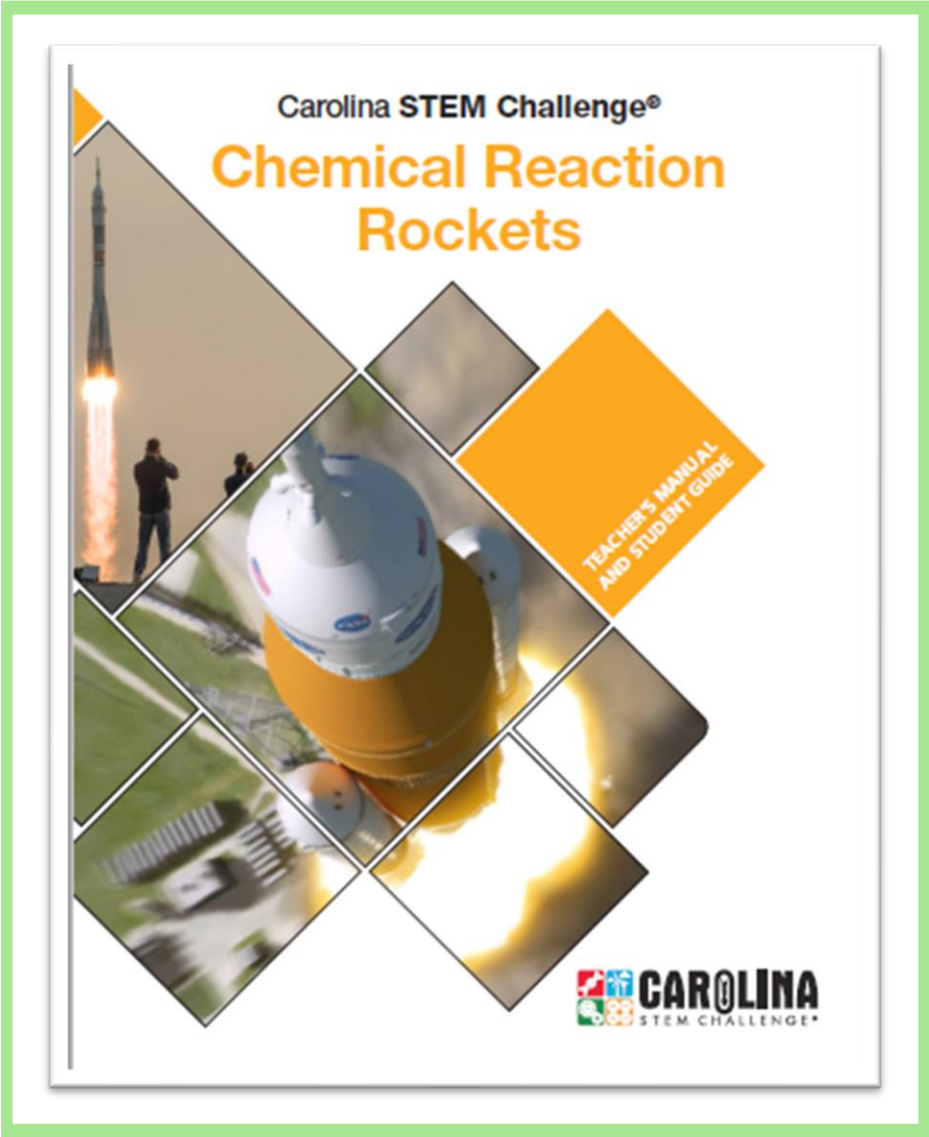
Chemical Reaction Rockets



Activities Overview

Chemical Reaction Rockets

Activity:

Optimize the rocket design and chemical reaction of the "rocket fuel"

Challenge:

Highest launch with a payload

SEPs: Asking questions, planning & carrying out investigations, analyzing and interpreting data, engaging in argument from evidence

Rocket Test Procedures

1. **Observe all safety protocols: Wear PPE, and keep rockets pointed away from people at all times.**
2. **One team member approaches the launch site with rocket pointed down and uncapped.**
3. **At the test site, you will receive your "launch training."**
4. **Once the rocket is set to launch, step back, and wait for the rocket to ascend.**
5. **Use the stopwatch to measure the time of descent between the rocket's highest altitude and its landing on the floor.**

In case of a FAILURE TO LAUNCH, a Carolina representative will disengage the rocket and return it to you.

Building Toward 3-Dimensional Learning

Balloon Race Cars

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
• Developing and using models • Planning and carrying out investigations • Analyzing and interpreting data	**PS 2A:** Forces and motion: The motion of an object is determined by the sum of the forces acting on it. **PS 3C:** When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object.	• Cause and effect: Mechanism and explanation • Scale, proportion, and quantity • Energy and matter: Flows, cycles, and conservation

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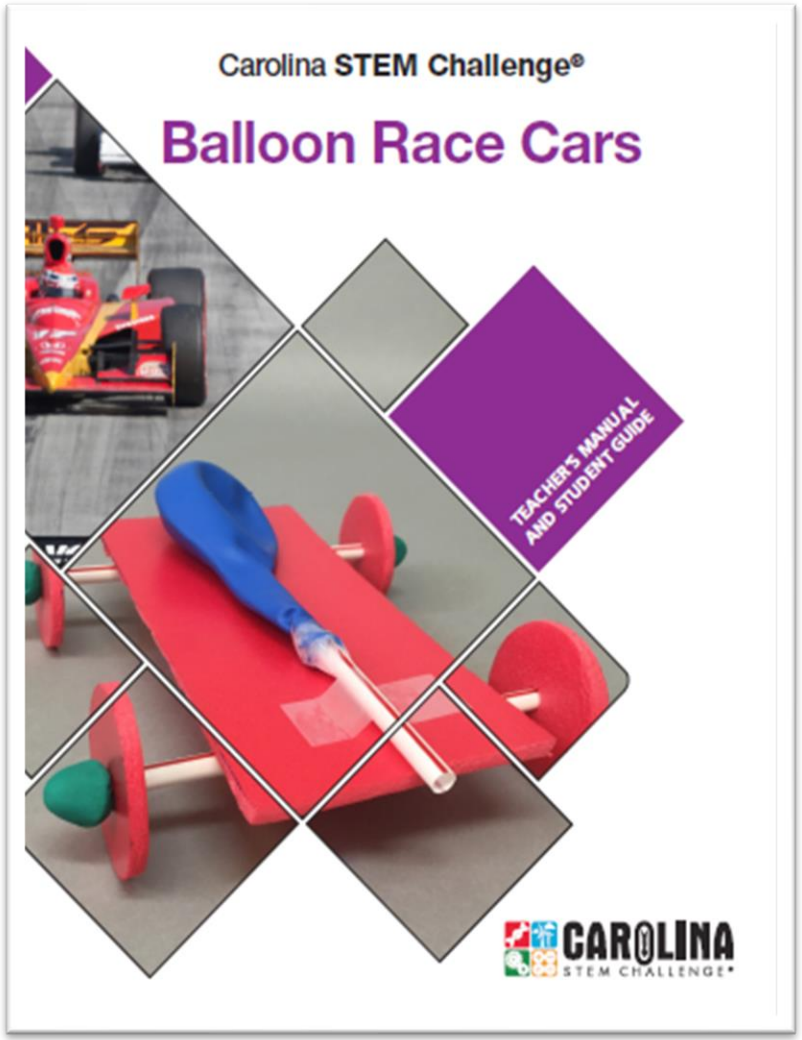
Balloon Race Cars



Activities Overview

Balloon Race Cars

Activity:

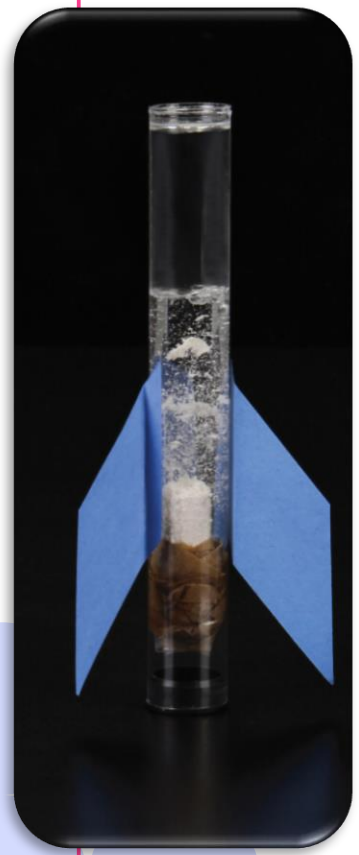
Build a balloon-powered race car

Challenge:

Go the farthest distance

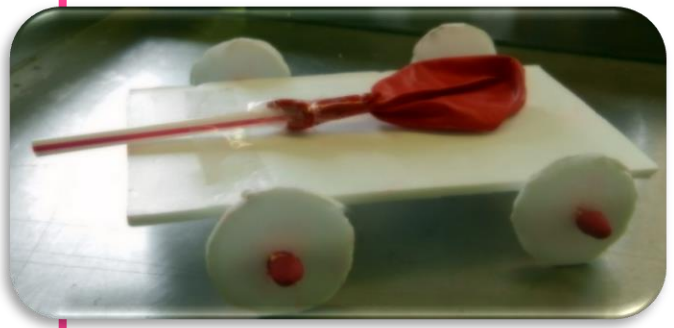
SEPs: Asking questions, planning & carrying out investigations, analyzing and interpreting data, engaging in argument from evidence

Workshop Summary



What did you learn?

- ***Chemical Rockets***
- ***Balloon Race Cars***



Newton’s Laws, Gas Laws, Stoichiometry, Chemical Reactions

Newton’s Laws, Force, Motion, Friction, Speed, Acceleration

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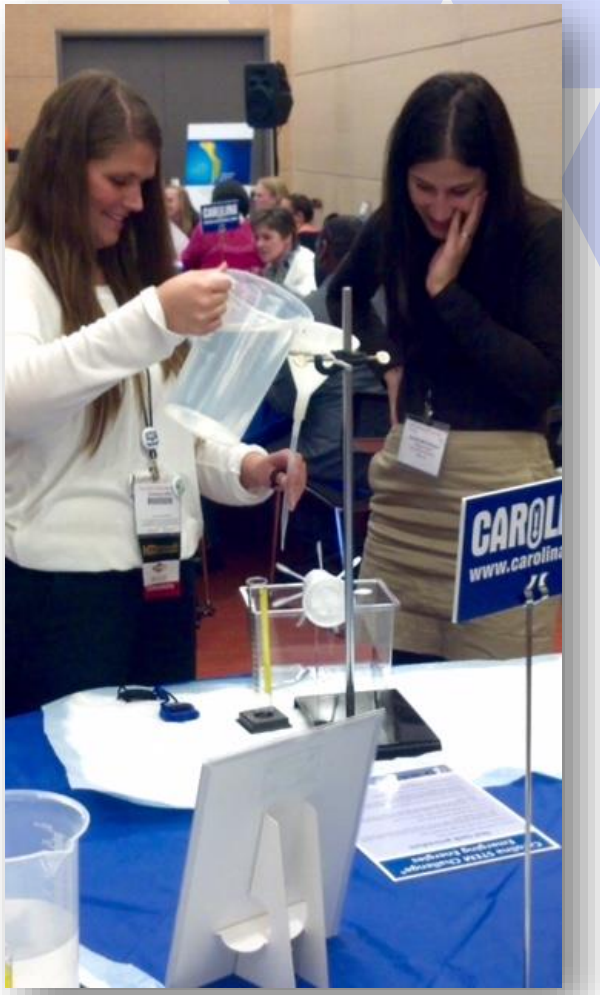
Carolina STEM Challenge®

- ✓ Easy to integrate
- ✓ High student engagement
- ✓ Engineering and STEM concepts
- ✓ Excite with real-world scenarios



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CAROLINA STEM CHALLENGE®

PHYSICAL SCIENCE

- Balloon Race Cars
- Boats & Buoyancy
- Build It Write
- Cartesian Divers
- Egg Drop
- Motors
- Mousetrap Cars
- Paint Stirrer Catapult
- Projectile Launcher
- Roller Coasters
- Sound Off
- Balloon Rockets
- Structures
- Keep It Hot
- Bubbles
- Trebuchets
- Take Flight

LIFE SCIENCE

- Circulatory System
- How to Train Your Isopod
- Hydroponics
- How to Train a Plant
- 3-D Art and Human Vision

EMERGING ENERGIES

- Battery Dilemma
- Biofuels
- Geothermal
- Hydroelectric Power
- Passive Solar Design
- Solar Car Design
- Wind Farm
- Solar Water Distillation
- Emerging Energies Set

CHEMISTRY

- Make It Bounce
- Separation of a Mixture
- Chemical Reaction Rockets
- Crystal Growing

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