Rocketry Unit Plan

Overview:
In this unit students will learn the fundamentals of rocketry science. The first part of the unit explores the motion of rockets. The students will conduct experiments to build on the basics of rocketry motion. Students will then take what they've learned to design, construct, and launch a model rocket. After launching, students will be able to make modifications to their rockets to try to improve launching results.

Goal:
Students will learn about the science of rocketry in order to design, construct, and launch a model rocket.

Unit duration: 6 weeks

By the end of this unit, students will be able to:

- Identify fundamental parts of a model rocket.
- Create a design plan for a model rocket.
- Build a model rocket.
- Modify the model rocket for launching improvements.

Materials

- Model rocket kits
- Electric Launch system
- Launch pad
- Batteries (for launching remote)
- Rulers
- Scissors
- Sandpaper
- Pencils
- 16 oz bottles
- String
- Rubber bands
- Water
- Drinking straws
- Tape
- Balloons
- Paper
- Elmer's glue

Resources

- BOCES Rocketry Science Kit (includes rocket kits, launch system, & launch pad)
- "Rockets Away!" Kit from The Ohio State University Extension
- http://www.ag.ohio-state.edu/~rockets/

Timeline
2 months prior: Planning/budget
1 month prior: Order supplies
2 weeks prior: Ensure all materials have arrived (sort them by lesson/experiment)
1 week prior: Prepare for lessons/experiments

Activity Overview

Week	Activity	Activity outline	Guiding questions
1	**Exploring the Motion of Rockets**	Experiment 1 - Let's Get Lifting Lift bottles of various masses (filled with various amounts of water) attached to a string & rubber band; measure the stretched rubber band when lifting the bottles to see the difference in force needed to lift the bottles Experiment 2 – Coming & Going Affix an 8' string through a straw & attach to the ends to 2 chairs; attach an inflated balloon to the straw at one end of the string; release the balloon & observe how it travels along the string **Experiments taken from "Rockets Away"*	How do rockets move? Experiment 1: Would the experiment work the same in the weightlessness of space? Experiment 2: Would the size & shape of the balloon affect its performance? Would adding weight to the balloon affect its performance?
2	**Building on the Basics**	Experiment – Add a Nozzle, Stick, & Fin Nozzle: Inflate a balloon, release it, & observe its movements; insert/attach a 1" piece of straw in the open end of the same balloon, inflate it, release it, & observe its movements Stick: Insert a whole straw into the end of the straw already in the balloon (nozzle); inflate the balloon, release it, & observe its movements Fin: Cut a 3" square in half diagonally; attach it to the end of the straw (stick) with tape; inflate the balloon, release it, & observe its movements **Experiments taken from "Rockets Away"*	Nozzle: What would happen if you added length to the nozzle? Fin: Are there certain fin configurations that work better than others? Would more fins work better than one?
3	**Rocket Design & Preparation** **(This may take more than one session)**	Draw a design for a model rocket & share with others in the group Use the steps in a model rocket kit to prepare the fins, body tube, nose cone and recovery system for the model rocket *Encourage students to use the kit as merely a guide for the model rocket – they can alter some of the parts and/or use different materials instead of those provided in the kit	What other materials can be substituted for some of the model rocket parts? What do you think the best shape is for your nose cone and fins (rounded, pointed, etc.)?
4	**Rocket Construction** **(This may take more than one session)**	Build the model rocket by attaching the parts to the body tube • nose cone • stabilizing fins • recovery system • engine • ignitor wires/plug • launch lug *Students may wish to spray paint their rockets.	Where is the best placement for the fins along the body tube? How many fins will provide the best stability? Would a parachute or streamer perform better for the recovery system?

5	**Rocket Launch** **(This may take more than one session)**	Set up the launching station Students will each launch their rocket Students can make modifications to their rockets based on rocket launch performance and relaunch their rockets	Which rockets were the most stable during launching? Which rockets launched the highest? Which rockets seemed to have the best recovery system?