Ignite the Spark: Fire, Explosions, and the Science Behind the Boom!

Anyone can be a Pyro and Teacher!- Jason Zackowski
Anyone can be a Pyro- Convicted Arsonist

As Science Teachers We have a Super Power

You have such a POWERFUL responsibility

We can ALL IMPROVE and when we do our students improve

Your SPARK in SCIENCE COULD FUEL THE NEXT SCIENTIST

Ok - The Experiments!!!!!/ Demos!!!!!

The experiments will range in difficulty and safety today.

Using Fire and Chemicals is dangerous and I'll concede that point...but…

Science is a subject that can ignite a passion inside of kids and fill them with wonder. Science should ALWAYS be as exciting as possible…..and that entails teachers need to get out of their comfort zone.

It takes time to set up and do experiments, but the engagement factor is so worth it.

Kids should be allowed to break stuff more often.

That's a consequence of exploration.

Exploration is what you do when you don't know what you're doing.

Neil deGrasse Tyson

If you can’t make **Science Exciting** or don’t have a drive to at least try, maybe you shouldn’t be teaching it in the first place.

-Me

Difficulty Guide

Duplo- anyone can do this with very simple materials you can buy at the store

Lego- you may need to order chemicals, but you could find them or use “alternative ones”. Some prep work is required.

Mechano- you will have to order chemicals and you will need specific glassware

Ikea- you probably have to build something. It may or may not need 1, 000, 000 tiny tab things.

Safety Guide

Fairly Safe: All Demos have a range of safety concerns, and since you’re using fire, there is always the risk of fire issues. To be safe, check your surroundings for flammable items, watch out for long hair. Worst case scenario, kids may suffer very minor burns.

Safety Guide

Take Precautions: The safety here has been upped. Know where your fire extinguishers are just in case. Let only a few kids go at a time, carefully controlling the flammable material and means of fire. If you let a bunch of kids run these, you run the risk of it getting out of hand and someone getting hurt. Practice it before so you know the range it will project in the classroom.

Teacher Only

Teacher Only: Only you get to set up and prep the experiment. Know where your fire extinguishers are. Protect the class with range from the experiment. You can get kids to do the demo with you- but one student, the rest seat/standing and controlled.

You do, they watch. Or you do, one kid helps, the rest sit and it is done in a controlled fashion.

The experiments and Demonstrations

1. Teabag Rockets
2. Pill Popper Rockets
3. Matchstick Rockets
4. Ethanol Rockets
5. Ping Pong Ball Blasters
6. Big Explosion if time

Teabag Rockets

Ease of Setup?

Duplo

Lego

Mechano

Ikea

Where can I use it:

Grade 4: Energy and Matter
Grade 6: Force and Motion
Grade 7: Heat and Temperature
Grade 9: Energy Transformation
Grade 9/10 Flow of Energy
High School Physics: Flow of Energy

TeaBag Rockets Safety Level

Fairly Safe

-light only a few at a time

-watch for ash

-rising ash may hit ceiling

-make sure you don’t have

Flammable stuff on your ceiling.

The teabag must be able to be cut from the top and bottom. This creates a cylinder, which is the mechanism for the rising of the teabag.

The burning teabag creates warm, less dense air, which causes a convection current. The ash of the teabag is so light, it is lifted with the teabag!

Pill Popper Rockets

Tight fitting film canisters (Amazon)

¼ full water

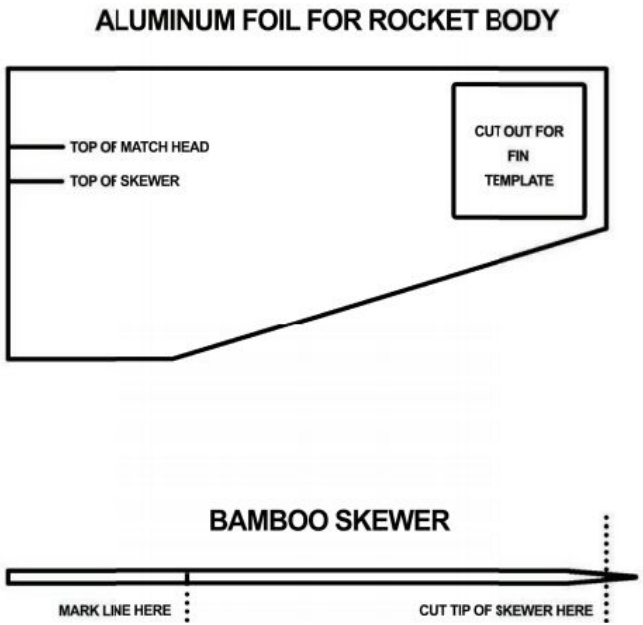
Small alka seltzer tablet Or Dry Ice

Cap

Flip

Get your face out of the way.

Match Stick Rocket! - I'll have the template via

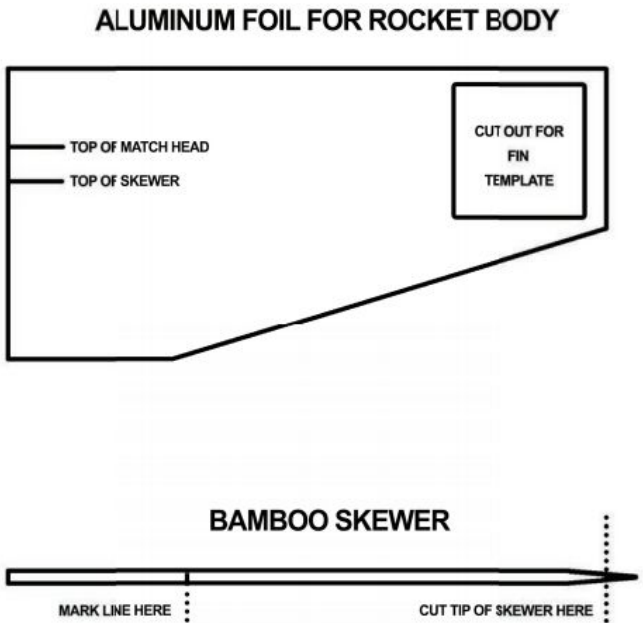


Grade 3:
Building A Variety of Materials
Testing Designs
Grade 4:
Building Devices and Vehicles that Move
Grade 5:
Classroom Chemistry
Grade 6:
Air and Aerodynamics
Flight
Sky Science
Evidence and Investigation

https://drive.google.com/file/d/1tUs8Sf2MNAynR0gw29Xk8wAeT-1mXO21/view?usp=sharing

https://docs.google.com/document/d/1tUs8Sf2MNAynR0gw29Xk8wAeT-1mXO21/edit?usp=sharing&ouid=117553493814476364123&rtpof=true&sd=true

Continued...



Grade 9: Space Exploration
Grade 10: Physics in Science 10
Grade 11: Physics Project

The Build

You will need

Old School Wooden Matchsticks (2-5 per kid)

Bamboo Skewers

Aluminium Foil

Scissors

Lighters or Candles

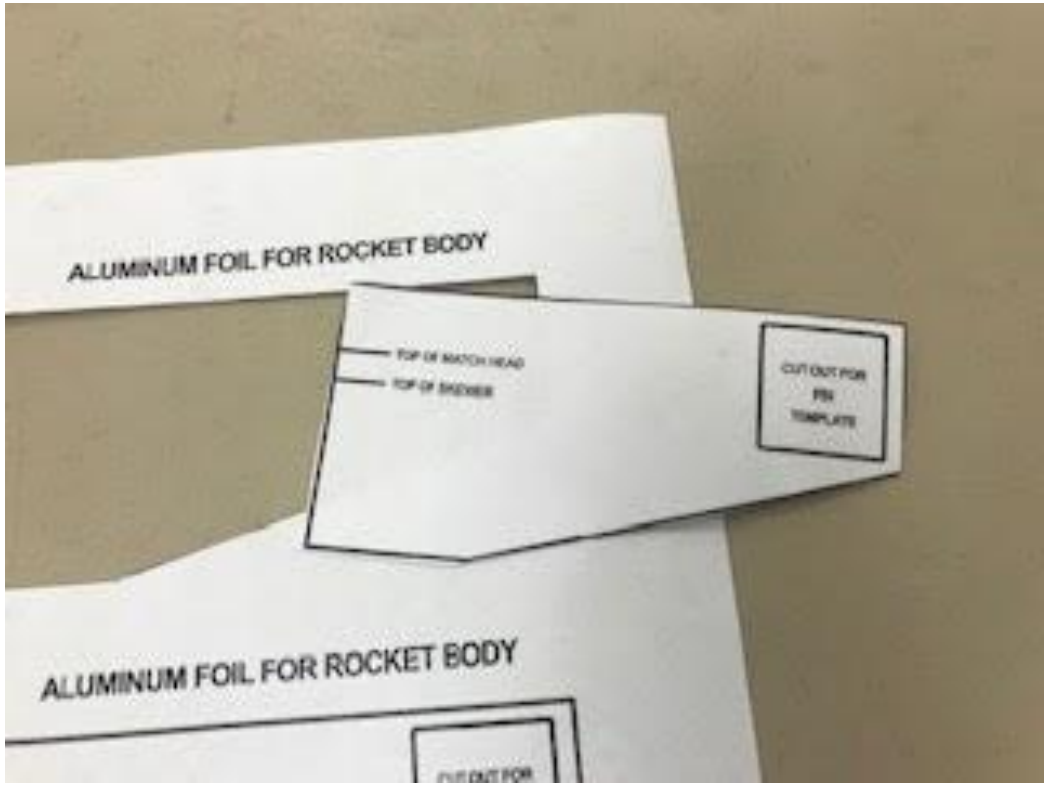
Pliers

Metallic Foil Tape

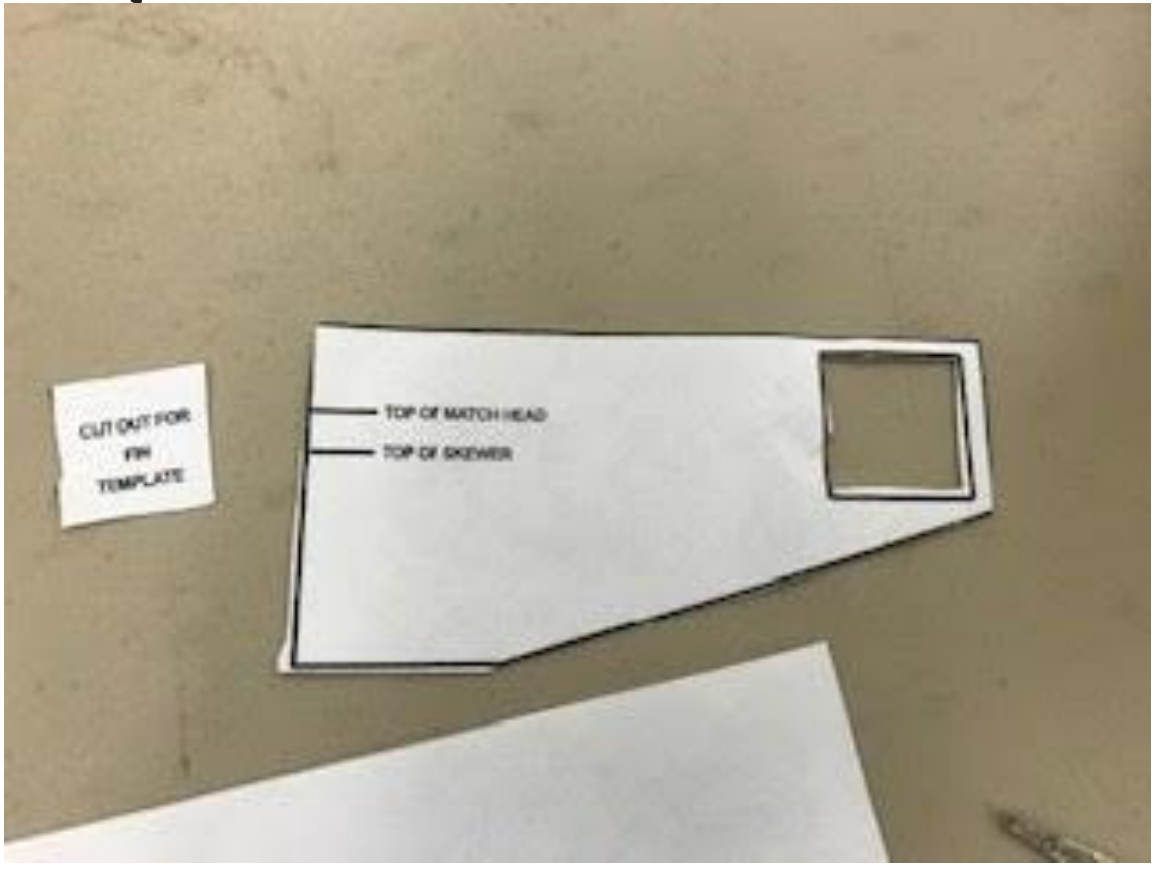
Steps!

1. Print out the template for kids. If you can print on cardstock, it helps with tracing, but not critical.
2. Have enough of the template for one per kid (and extras for mess ups)
3. Have the kids cut out the template and the little square in the template.
4. The kids will trace the template onto Al(s) foil.
5. The kids will trace the little square onto the metallic tape.

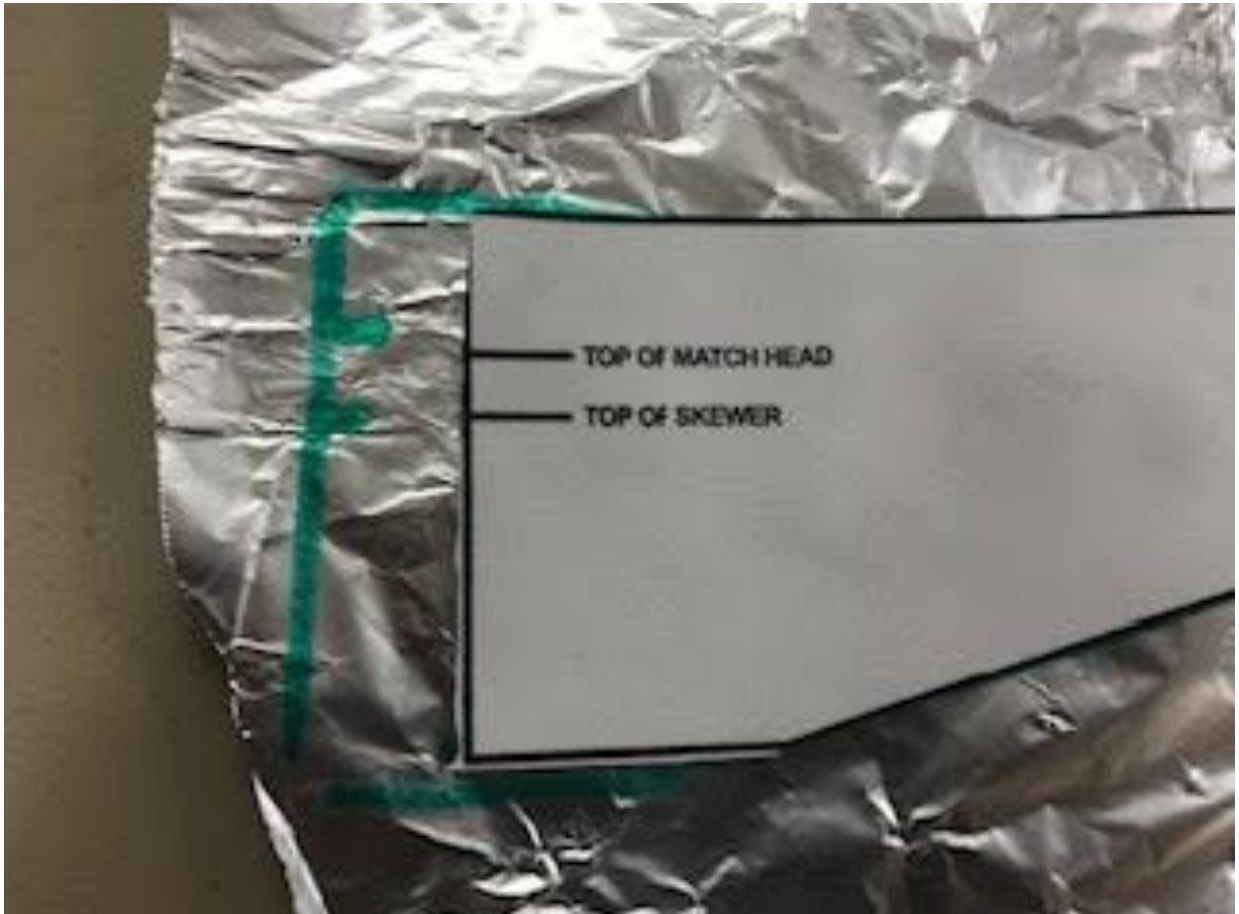
1. Cut out Template



Cut out Square in Template



Trace Template onto Tinfoil. Mark Top of Matchhead and Top of Skewer



Cut Head off Match

Cut point of Skewer. Put match head on TinFoil at mark and Skewer below at mark. Matchstick bottom not used.

Roll the tinfoil around the matchstick and skewer tightly. Roll it up until all tinfoil is rolled around assembly

Fold down any extra tinfoil found at the tip. Press with pliers to seal and crush matchstick chemicals

Using the square, trace a square onto tin foil Tape. Cut it out and cut a small hole at the top. When you unfold it the stick assembly should be able to pass through it.

Slide the square up to the bottom of the tinfoil and gently pinch together with two fingers to form a fin!

Using a lighter or candle, heat the end of the rocket up which has the matchstick chemicals! Watchout!

Steps Continued

6. I would cut the match heads off ahead of time for younger grades, but if you trust your kids, the next step is to cut off a match head- leave very little if ANY wood- you just want the chemical head.

7. Give the kids a bamboo skewer and get them to cut the tip off so that both ends are flat!

8. Using the template, have the kids position the skewer where it says to go and the match head where it says to go.

Steps Continued

9. Carefully roll up the foil from left to right so that it's tight! This is a tricky step and if they roll it off center, they will wind up with a loose roll.

10. Fold down the extra found at the tip and then crush it flat with pliers. This will crush the match head also, which is required.

11. Adding Fins is optional and tricky- up to you for your class!

Steps Continued

12. For fins, fold the little metallic tape in half, then half again, you should have a little triangle.

13. Cut off a bit of the top, you should have now made a hole in the middle.

14. Carefully (and this is hard for me) peel off the backing and lower the square over the rocket to the bottom of it.

15. Gently squish the tape together with two fingers on each hand. It should make four fins. If kids squish too hard, the rocket may stick to the skewer and it may not fly.

Launching!

The Rockets can fly across a classroom easily, so clear a path!

I’d launch one at a time for younger kids for sure, control it.

You can light a candle and the rocket where the match it just has to be heated up and it will launch!

Safety/Issues

Not all rockets will launch. Some will stick to the skewer if the kids roll them too tight.

The foil gets HOT, warn the kids not to pick up the rocket for 30 seconds.

The foil could cause burns, so don’t shoot it at flammable things.

Ethanol Rockets and Ethanol PinG Pong Shooters

Ease of Setup?

Duplo

Lego

Mechano

Ikea

Where can I use it:

Grade 5 Classroom Chemistry
Grade 6 Air and Aerodynamics
Grade 7 Heat and Temperature
Grade 8 Mix and Flow of Matter
Grade 9 Chemical Change, Exothermic Reactions
Grade 10 Chemical reactions, balancing and writing reactions
Chemistry: Mole ratio - mass to mass, etc

The rockets

Fairly Safe/Take Precautions

-light only one at time

-use a launch mechanism so it goes straight up

-bottles will smash into low ceiling

-use a U shaped stick, kids lighting it should wear eye protection

https://www.facebook.com/zedscience/videos/1379622062124710/

The Prep

Hard shell plastic pop bottles work best.

Have a large nail (a spike) handy and a hammer. The nail is driven through the lid of the pop bottle, making an exhaust port. I do this ahead of time, so it’s prepped for the kids.

Kids can design fins on their bottles to help with stability and flight.

Ethanol is squirted into the bottle and shook up to turn it into a gas.

The Prep Continued

The bottle is safely rigged up so it’s pointing straight up in the air.

Use a meter stick with a L shaped splint/popsicle stick assembly to safely light the bottle.

The Science

Ethanol combusts to form water and carbon dioxide.

It’s an exothermic reaction.

Newton’s third Law- the rapidly expanding gases and energy have nowhere to go, so they are directed down through the hole. This is a Force and an opposite force is applied to the bottle, rocketing it straight up.

Ping Pong Shooters

Safety: Fairly safe if firing one at a time

The Teacher controls both the accelerant and the fire source.

The ping pong ball can cause bruising if you get hit.

Obviously, practice.

Only have one student fire at one time.

Warn others- it can be loud.

How to Make?

You will need:

PVC pipe or ABS pipe (which you can but at LOWES or HOME DEPOT)(2 inch diameter)

Cut 50-60cm long with a hacksaw. (get your cardio in)

Use a glue gun or some kind of ABS glue to put a ring around the mouth of one end. This stops the pingpong ball from rolling back too far.

Prep Continued

Ping Pong balls that work best? The Smiley faced ones from Walmart. They just seem to shoot the best.

A hard plastic 591mL or approx size pop bottle works the best.

Using a knife or hacksaw, cut the top of the bottle off around 5-6cm.

Using copious Duct Tape, attach the bottle to the ABS/PVC pipe.

Finally, a small hole is cut at the bottom of the bottle twice the size of a splint or popsicle stick.

The Science

Ethanol combusts to form water and carbon dioxide. Gases expand and take up much more space than liquids and solids.

It’s an exothermic reaction.

Newton’s third Law- the rapidly expanding gases and energy have nowhere to go, so they are directed up to the mouth of the bottle. This is where the ping pong resides.

ROUND TWO- BUNSEN AND BEAKER BREAK!


SCAN ME