

Same Old Activities? 25 STEM activities to try in 2015.

What are STEM activities? They are run for fun. They are not assessed. They can be any activity that demonstrates a scientific, technological, engineering or mathematical concept. We deliberately mix the activities in a way that does not distinguish them.

Find a collection of ideas and ways to run activities for a STEM club. Bought to you by the team from “How to Blow Up the Science Lab”. This workshop is run by The Mag-Net Online Association, a free networking environment for STEM teachers.

- Where did find them? Youtube and Google
- Where did we try them? Mostly at lunchtime!

List of 25 activities tried at Werribee Secondary College

Lava-lamp #1	Hot ice	Arduino
Lava-lamp #2	Remote control students	Making slime
Lava-lamp #3	Evil teddy	Methane bubbles
Remote control vehicles	Smartphone/iphone in class	Whooshing bottle
Hot air balloon	Ice-cream using ice	Quadcopters
Solar pizza oven	Ice-cream with liquid nitrogen	Making honey comb
Can crush	Ice-cream with dry ice	Making putty
Trebuchet	Invisible ink	Making a picaxe quiz board
Raspberry Pi	Making smoke bomb	

Lava-lamp

This activity helps explores different densities of liquids. There are 3 easy methods that can be picked to try. Do this in a dark room and shine a torch through the lava-lamp makes it very impressive demo.

Lava-lamp #1

Using a small cylinder, fill with vegetable oil $\frac{1}{4}$ full. Slowly add water until cylinder is $\frac{3}{4}$ full. Add few drops of food colouring and observe how what happens. Add a small spoon of salt and observe.

Lava-lamp #2

Using a small cylinder, fill with $\frac{1}{4}$ full water with food colouring, then with vegetable oil until cylinder is $\frac{3}{4}$ full. Place an Alka-Seltzer tablet (or any bubbling tablet) and watch it sink into the water layer. It will fizz up producing lava-lamp effect. Remember, do not have an air tight lid on – gas is produced and needs to escape.

Lava-lamp #3

Using a small cylinder, fill with $\frac{1}{4}$ full vinegar and fill with vegetable oil until $\frac{3}{4}$ full. Drop a prepared ice cube (containing baking soda and colouring) and watch it sink. Once it hits the vinegar layer, it will bubble up like a lava lamp. Again, do not have an air-tight lid to allow gas to escape.



Hot Air Balloon

Ask the dry cleaners for a few laundry bags – they might charge about 50 cents at most per bag or give for free! Use a bit of sticky tape to close any air holes on top. Test no air escapes by opening bag and filling it with air. Use straws and tape to create a base for the hot air balloon. On a heat proof mat (or concrete) pour a bit of alcohol (e.g. ethanol) into a heat proof dish (e.g. crucible or evaporating basin). Place hot air balloon above it and light the alcohol. If it floats, you can improve the design by using foil and thin copper wire to make a little basket so that it can float with its own heat source. Caution...don't add a lot of ethanol and make sure a wet cloth is nearby to put out fires.

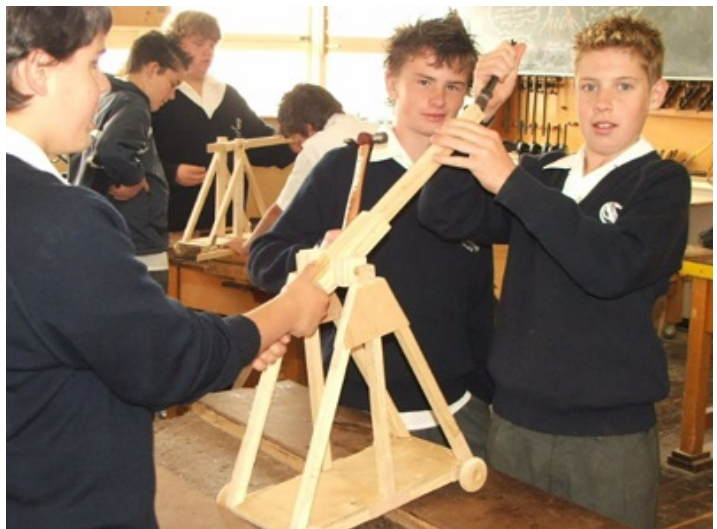


Can crush

Use pizza boxes and use newspapers to line the inside of pizza box. Make a foldable flap on top and cover with foil if you want to make a 'solar panel'. Use foil to line inside the oven, then place black paper on the base. Use a piece of foil as your 'grill' and place in the sun. I used marshmallows and chocolate to test how well it heats up. This requires an empty aluminium soft drink can with a small amount of water. Boil this over a Bunsen burner until steam comes off and the water almost boiled off. Use tongs to turn it upside down and place into tub of water. It should collapse from air pressure.

A larger version... <http://www.youtube.com/watch?v=JsoE4F2Pb20>

Trebuchet – Talking to your Technology Colleagues



Hot ice

Use a clean beaker and put desired amount of sodium acetate. Heat on hotplate until it dissolves (no need to add water, although you can add a small amount to get it started). When dissolved, keep boiling until the top appears glassy – this indicates overheating. Turn off hotplate and add small amounts of water until the glassy appearance is gone. Cover with gladwrap and allow to cool. When cool enough to touch, place in ice bath or fridge.

To see instant 'ice', drop a crystal of sodium acetate. This link was quite useful: <https://www.youtube.com/watch?v=aC-KOYQsIVU>

Remote control students

We use Picaxe and Yenka to design and build these applications.

and Evil Teddy

Smartphone/Iphone in class

How do they work? Can you block them?

Icecream using ice and salt

Students learn that ice with salt can get below zero degrees, sufficient enough to freeze an icecream mixture. A tub of ice with small amount of water and salt can be used, then place a zip lock bag containing 1 part cream and 1 part milk with flavouring (sugar, syrups or pureed fruit). To keep the icecream soft, keep moving it in the tub to keep the ice crystals in the icecream small.

Use a thermometer to monitor the temperature drop as salt mixes with the ice and see how low it can go. You can also experiment the difference between icecream with large crystals vs. icecream with small crystals.

Icecream with liquid nitrogen

Use the same icecream recipe with ice, but place the ingredients in a steel bowl. Add liquid nitrogen and stir the icecream. Once all the liquid nitrogen has boiled off, the icecream is safe to eat.

To obtain liquid nitrogen it will require a special dewar. While expensive to purchase, an alternative is to check with nearby schools to borrow one. I used "Liquid Nitrogen Services" company and that provided me with 10L for \$75 including delivery!

Remember to read the MSDS and how to handle liquid nitrogen.

Ice cream with dry ice

Use the same ice cream recipe, but pour this into ice cream maker. You can pre chill the ice cream maker to make the first batch of ice cream, but it will warm up fast, so take crushed dry ice (note: do not handle dry ice with bare hands for long, use utensils) and pour large spoons full while the ice cream maker is churning. Once the ice cream is hardening, stop adding dry ice and allow it to churn for another minute. Scoop out the ice cream and stir to check for any bits of dry ice – even if there are some bits, these will sublime quickly.

Invisible ink

Mix lemon juice and sugar, then use a brush to write on a piece of paper. Use a toaster or Bunsen burner with 2 gauze mats (this keeps the paper from burning) and place paper over it.

I have also used laundry powder in water, as invisible ink. To reveal, use UV light (or blacklight) to see the words.

Making smoke bomb

This one requires careful organisation. Safety precautions should include a bucket of water and heatproof gloves. I used 6 spoons of potassium nitrate and 4 spoons of sugar. This is heated in a beaker until yellow-caramel colour over medium heat with constant stirring. If overheated and it self-ignites, use gloves and remove from heat and place in fume cupboard.

Once finished, place in a container made by folding foil with a candle around it to act as a fuse.

Take this outside to the oval and light this (and keep the children back). Afterwards, pour bucket of water to ensure it cools down.

Making cells with jelly

Many students have problems with remembering cell components, especially the cytoplasm. Use jelly, gladwrap, smarties and sweets to represent cell components. A membrane can be made by poking different shape holes to represent the membrane allowing things in and out of the cell.

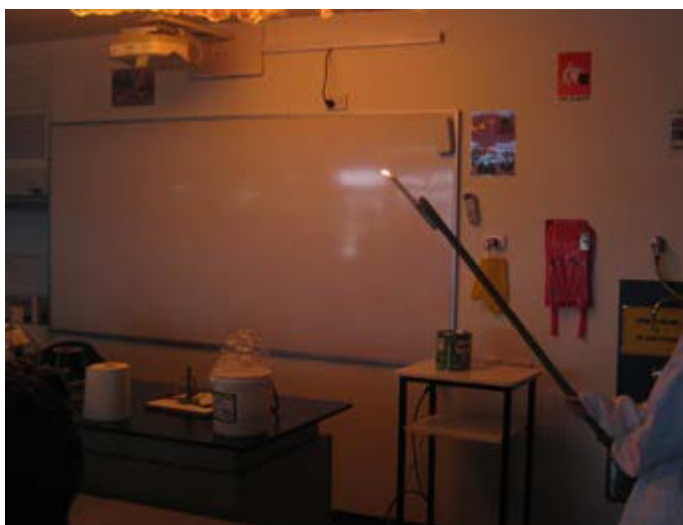
Making slime

David found using colouring, PVA glue (20 mL) and borax (5 drops or so) provide a 'tougher' and more waterproof slime than using polyvinyl alcohol, although it won't be transparent.

Methane bubbles

Use a bucket with detergent, glycerol (glycerine) and water to make strong bubble mixture. The quantities are approximate at about 1 tablespoons of glycerol, 20 mL of detergent and 1 L of water. This does not have to be exact. Let the mixture mixed well (and not undissolved on the bottom of the bucket). Use a gas hose and pump gas to the bucket to form bubbles. It may be necessary to help release those bubbles. As methane is lighter than air, these bubbles will float upwards. Use a candle on a stick to ignite these bubbles.

If too much bubbles burst without igniting, then methane gas might build up in the area. It may be necessary then to dissipate the gas before proceeding further.



Whooshing bottle

Find a large container (bell jar or water cooler dispenser). Pour small amounts of alcohol (e.g. ethanol) and roll the jar to ensure it has covered the entire inner surface. Pour out excess alcohol. Ignite by lighting a match on top of container. This experiment demonstrates that water is produced in a combustion reaction.

Quadcopters

We buy our quadcopters commercially. We can't fly them, but the students can!

Making honeycomb

This demonstrates how gas is produced in cooking which can be used for making cakes rise or bubbles in honey comb.

In a pan, heat 5 tablespoons of sugar and 2 tablespoons of golden syrup. Depending on the desired flavour (from sugary to bitter sweet) melt the sugar to golden yellow to golden brown colour. Do this under medium heat.

Add 1 table spoon of baking soda (bicarbonate of soda), stir quick and pour onto tray with grease/baking paper. To wash pan, bathe in hot water and it will dissolve.

Making putty

In tub, mix cornflour and water in equal amounts. Experiment with putty in terms of applying a force quickly and slowly to it. You can vary the amounts of cornflour to putty in order to experiment how the properties change.

Making a quiz board

Using a piece of cardboard, make a series of holes on the board, then write questions and answers on either side. Use wires to connect the matched questions to answers on the back of the cardboard. You can now add speakers or light to a battery and use the quiz board to complete the circuit. Picaxe can then be used to develop more complex decision-making circuits.

